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The ELECTRICAL REVIEW

FOUNDED 1872

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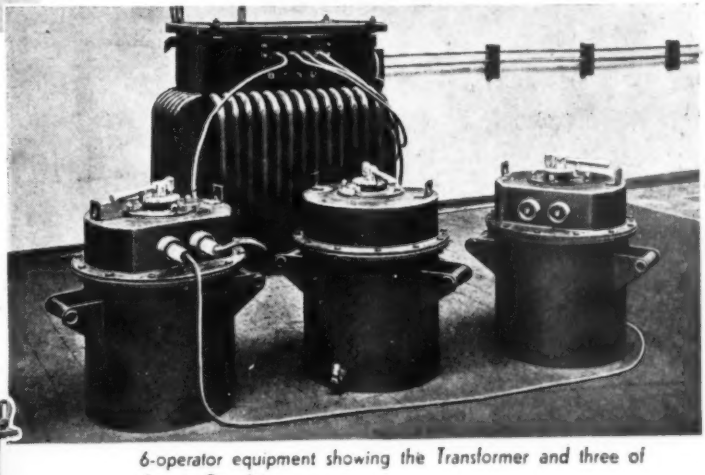

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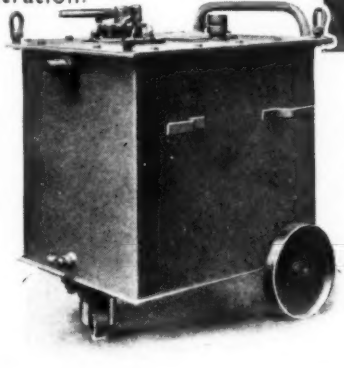

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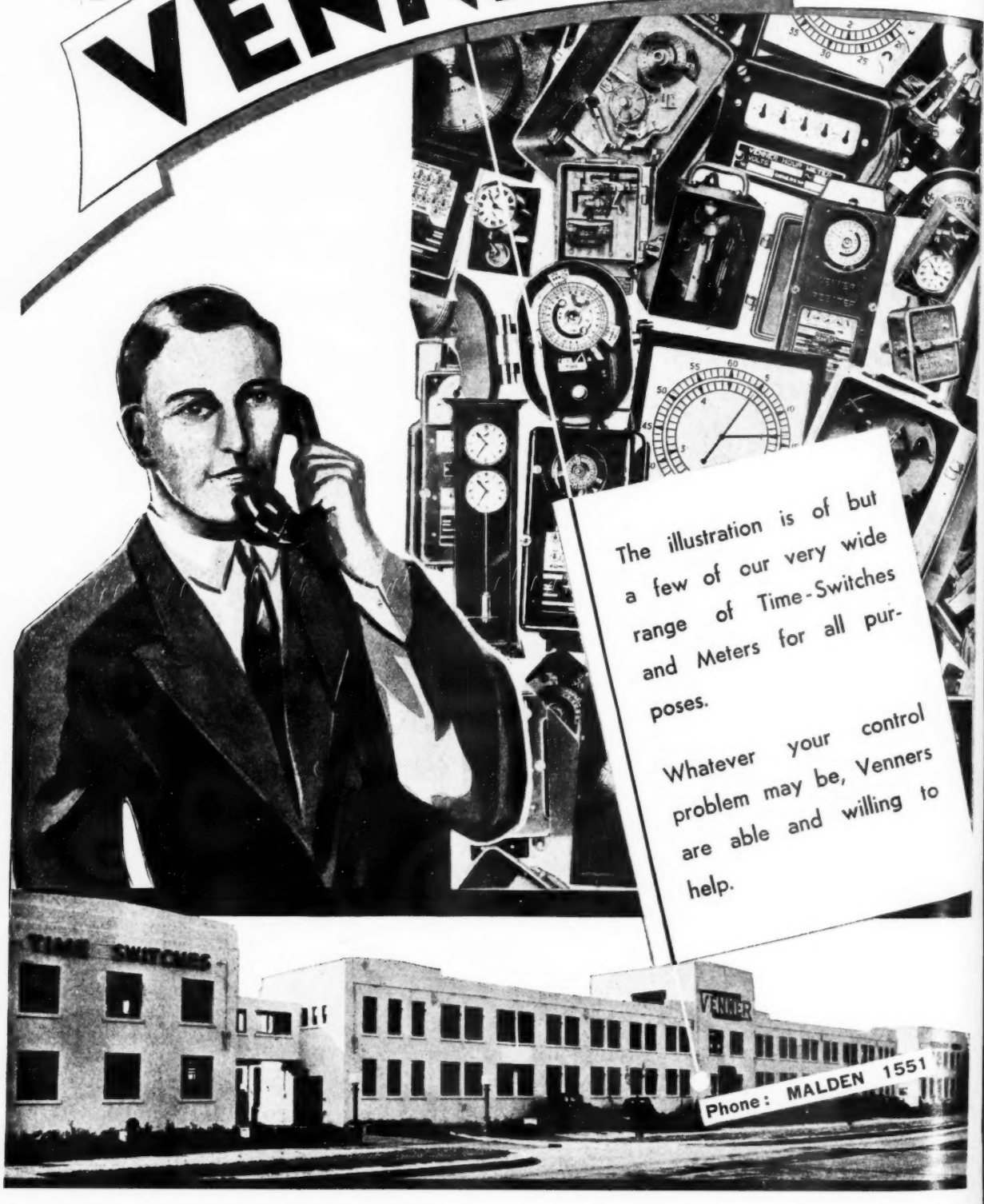
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The
Electrical Review

VOL. CXVII. DECEMBER 6, 1935. No. 3028.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

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Industrial Power Considerations

THE relationship of the prime mover to the electrical industry has to be looked at from two angles. In the power station the turbine or engine is both servant and master; in the factory as direct driver it is a serious rival to the supply authority, although other sections of the electrical industry may benefit.

Where there is willingness to appreciate facts correct presentation of such advantages of electric driving as flexibility, lower power transmission losses, and automatic control will generally win over a system to electrical operation, either by private generation or public supply, and often the works manager admits that sitting on the fence waiting for a factory prime mover to die from natural causes has been the only reason for the long reign of a mechanical drive.

Whispered accusations suggesting "uneconomical supply tariffs" and the "giving away of oil engines" have entertained us, but it may well be that the competition between the prime mover maker and public supply has done, and will continue to do, much good to the industry as a whole.

Where process steam is required, however, the arguments seem to be almost entirely in favour of the pass-out turbine, and we suppose that that must inevitably be the case all the time that 70 per cent. of the heat generated in the boiler is ejected into the condenser. We certainly cannot visualise any reasonable proposition other than private generation for such a large industrial concern as the paper mills in Kent of Messrs. Edward Lloyd, Ltd., where process-heat requirements dominate the situation and the electrical output is about the same as that of the Sheffield undertaking.

To be able to use waste heat in the prime mover presents another strong case for private generation, and in this way, coupled with the scientific regulation of its own load to give a 70 per cent. load factor, the Staveley Coal and Iron Co., Ltd., has been able to supply 20 million and more kWh per year to the public at about ½d. per kWh.

Load factor is another influence which decides the place of the prime mover. At the printing works of Messrs. Kelly's Directories, Ltd., such a wretched load factor as 8 or 10 per cent. is nursed into showing healthy costs figures by the careful regulation of small prime movers on site. Shall we congratulate the oil-engine advocates on the excellent showing at Andover, or call them to task for the many installations comparable with Kelly's that we know of on public supply?

Good load factor, on the other hand, is the best friend of public supply, and 86 per cent. load factor resulting from scientific regulation of machinery which would normally produce heavy peaks, as is the case at the West Thurrock Cement Works of the Tunnel Portland Cement Co., Ltd., points to proper co-operation.

Continuity of supply is also of vital importance, and where a shut-down would result in the waste of large quantities of valuable material the prime mover on site has a big pull.

Advantages to the industrial concern by way of relief from the responsibilities of electricity generation do not usually carry weight, for to the commercial concern they have a meaning only when expressed in £ s. d.

The Future in Australia

QUALIFIED optimism characterises the report by Mr. A. W. Burton (Mr. R. W. Dalton's assistant) on the Australian situation, which is reviewed on page 791. Trade in 1934-35, although considerably better, still fell far short of the 1928-29 level. Both tariffs and depreciated exchange have operated against exports from Great Britain, but our electrical manufacturers still manage to secure half of the total import trade, and their share has steadily risen in the last two or three years. The fall in the imports of machines and machinery (including electrical apparatus) has been heavy. In 1929-30 the total value was £14,286,642, whereas by 1933-34 it had fallen to £4,264,733. The position of home manufacturers seems to be strongest in the heavier classes of elec-

trical goods. For instance, in 1933-34 they supplied 85 per cent. of the d.c. motors (72 per cent. in 1932-33), 79 per cent. of the a.c. motors (against 73 per cent.), and 63 per cent. of the fractional h.p. motors (52 per cent.). There has been a noteworthy advance in one very competitive item: home manufacturers supplied 64 per cent., against 48 per cent., of the imports of electric filament lamps. Upon the whole the situation is not hopeless. There is a growing tendency to relax the rigour of import duties, and this, combined with the natural growth of the Commonwealth, should present greater opportunities in the near future.

Street Market Lighting

IF there were dangers in the naphtha flares which were once very largely used for lighting stalls in street markets, there may be as much risk with the electric "hook-ups" which are now often employed. Attention was drawn to the matter by a correspondent in our November 22nd issue, and this week Mr. R. H. Harral, the engineer and manager, gives some particulars of the way in which Blackburn has met the needs of the stall-holders in its open-air market by providing a safe distribution scheme. Most towns of any size have their street markets, to which such a system as this would be applicable. The demand may be a fairly large one, and even if it comes on the peak load engineers may find it worth picking up. It will, at least, provide a further means of advertising the adaptability of electricity.

Johannesburg Exhibition

THE great prosperity of Johannesburg, and the prospect of continuing expansion of the city and its interests for many years to come, may be said to have inspired those who are responsible for the exhibition which is to be held there next year (from September, 1936, to January, 1937). The extension of the mines during the past ten years has brought about a substantial increase in imports, and startling evidence of present activity lies in the fact that last year the City of Johannesburg passed building plans to the value of £6,000,000. The idea of holding a great exhibition there to celebrate Johannesburg's fiftieth year has received handsome support from the Union Government, and South African industrial and commercial firms have taken more than half of the space in the projected industrial hall. We published some preliminary details of the scheme in the ELECTRICAL REVIEW of March 8th (p. 355). It will, no doubt, attract many visitors from various parts of the Empire, and it is important that British engineering interests should be strongly in evidence in the Industrial Hall. We hope that the Federation of British Industries, which is responsible in this country for British exhibits, will receive adequate support from the electrical and allied interests. Major C. C. Frye, the chairman of the organising committee in Johannesburg, delivered a speech in London on Friday last, to which reference is made in our "Business Notes" to-day.

Heat Distribution

AT the I.E.E. Birmingham dinner Mr. J. M. Kennedy, the president, hinted that electricity supply undertakings might have to pay more for their coal. An increase in the price per ton, however, that was large enough to discourage the use of electricity in the many cases in which there is little margin between cost and selling price would not help the collieries to the extent some anticipate; the alternative to electrode boilers, for instance, is often imported oil. Electricity is, in this country, essentially a method of distributing the heat contained in coal, and there is little difference in the B.th.u. used by the householder whether low-grade coal be burned at a generating-station or high-grade coal on the hearth. The main point, though, is that it is not on grounds of thermal efficiency that electricity has secured its position but of general convenience in application. Thus, owing to its suitability for between-season, luxury and intermittent heating, when the labour involved in laying and cleaning would rule out a coal fire, electricity actually adds to the amount of coal used for domestic requirements.

Pay Them Well

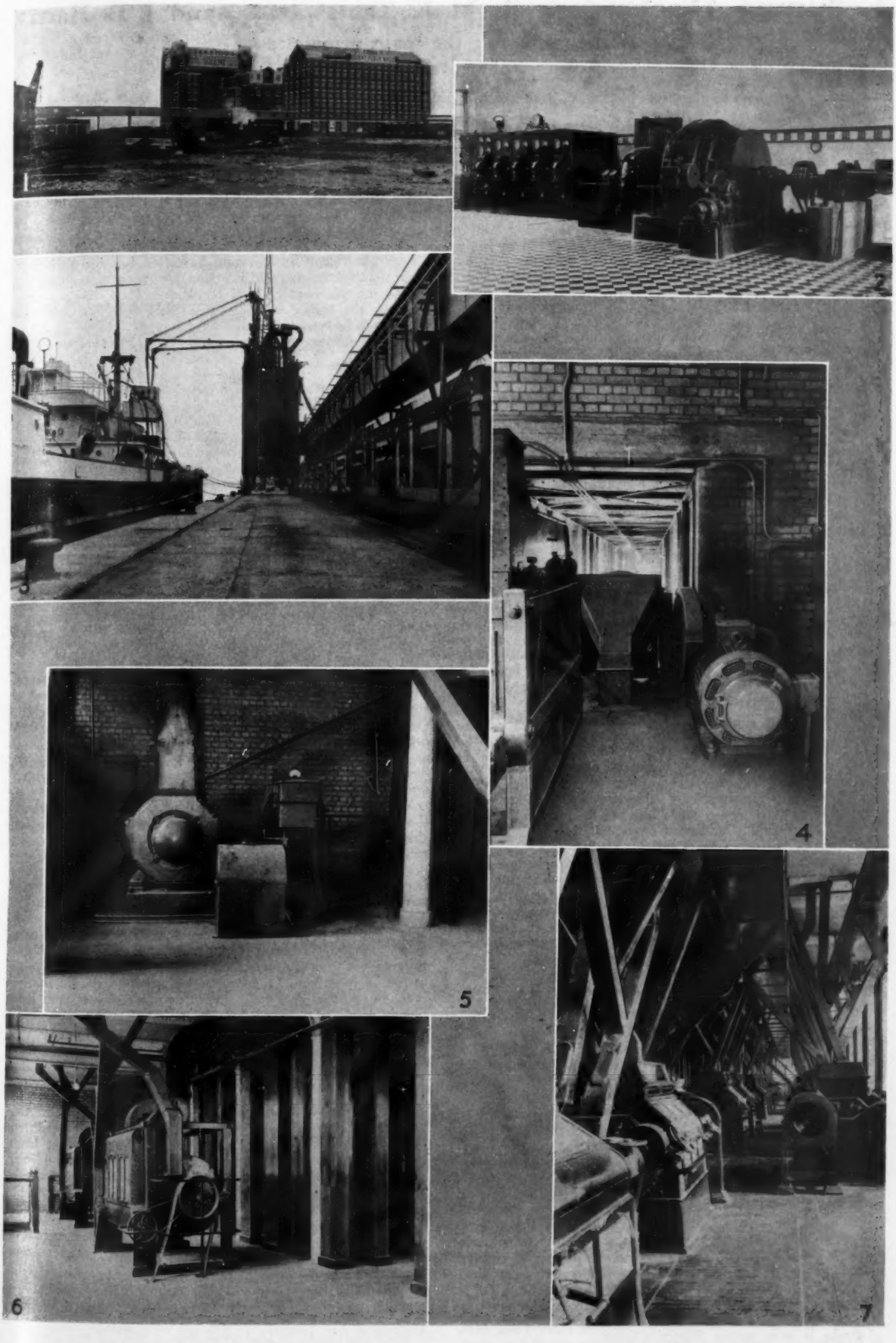
WE hope that the electricity supply industry will not make a habit of undervaluing the services of its canvassing representatives. If the standard adopted be low there may be a disposition to feel that anybody will do. A wage or salary must be paid that will make the job worth while. If we mean to secure the best results, whether in isolated areas or in a national million-more-consumers campaign, we must engage capable and ambitious young men and women. They should be able to keep up appearances and carry the impression of a live electricity service along with them. If we pay a reasonable remuneration they will be able to do that and will also be encouraged to add to their qualifications. It is generally recognised that we are short of the right type of canvassers as things are, notwithstanding association training qualifications and diplomas, and if we get a real move on in the unenterprising or gas-ridden areas there will be a need for many hundreds, perhaps thousands, to become qualified. But let us start right. In the early days we sinned pitifully in dealing with junior technical staffs; do not let us make the same mistake with our commercial staffs now. We hope that undertakings will not make new appointments without due attention to competence. Notions that any Tom, Dick or Dorothy will do for a house-to-house visitation or showroom duty must not prevail.

Notice of Accidents

A NEW "Dangerous Occurrences Notification Order" (No. 1046) has been made by the Home Office (Stationery Office, 1d.) and becomes operative in the New Year. Among its provisions is one that in any factory or workshop an "electrical short-circuit or failure of electrical machinery, plant or apparatus, attended by explosion or fire or causing structural damage thereto, and involving its stoppage or disuse for not less than five hours" shall be reported to an inspector. This rule holds whether personal injury or disablement is caused or not. The new Order does not materially differ from No. 876 of November 9th, 1928, which it will supersede, but it makes clear two important points regarding which some doubt was formerly entertained. These are that (1) the requirements relate to unattended as well as to attended sub-stations, and (2) that the plant affected shall be out of use, and not merely the supply interrupted, for the period named.

London and the Rest

THE area included in the Return for 1933-34 published by the London and Home Counties Joint Electricity Authority absorbs about one-quarter of the electricity sold in Great Britain, and its effects on the combined results are therefore considerable. In taking into account the kWh used for various purposes, the variations from the average in the London area are such as to indicate a need to weight the corresponding figures in the total for the whole country in order to get an idea of the trend of events elsewhere. Thus domestic supplies, which account for just over one-third of the output in Great Britain, represent 45 per cent. of the output of the eighty-three undertakings in the London district, where street lighting and traction (from public systems) also form an appreciably greater proportion of the total. The balance is due to the greater relative amount of energy sold for industrial purposes in the provinces, as shown by the percentages of 39 (London) and 56 (total). It happens that the average prices charged follow the variations, though at a distance. Thus, consumers pay about 4 per cent. less for domestic supplies in the London district but nearly 20 per cent. more for power.



Some of the plant at Messrs. Rank's flour mills. **(See page 775)**

1. The Solent Flour Mills. 2. The 560-h.p. main mill drive (h.p. cubicles on the left). 3. Travelling suction intake plant. 4. Main unloading gantry belt and drive. 5. Main drive for the screening-house equipment. 6. Emery scourers in screening house. 7. Lines of grinding rolls

Lightning Discharges.

By M. K. Tantawi, B.Sc., and J. B. Harris

A new theory: the main principles of protection

MANY theories have been put forward to explain lightning, but increased knowledge and thorough study and investigations with modern apparatus have rejected all but two of such hypotheses.

The general idea drawn from text-books is that during a thunderstorm a cloud obtains a charge which continues to increase, inducing opposite charges on the upper and lower surfaces of a lower cloud. If the induced charge is sufficiently high a flash may occur between any two adjacent clouds or between a cloud and earth. In other words, a cloud may be considered to be a conducting body floating in an insulating medium (air).

The discovery of the Röntgen rays and the subsequent work carried out by Elster and Wilson have shown that air is a conductor, and that its resistance may be simply expressed by saying that the resistivity of the lower atmosphere in clear weather is 4.5 or 10^{18} ohms per cm. cube. Under normal potential differences air may be considered a perfect insulator; but when voltages are sufficiently high (as those associated with a thunderstorm) a point may be reached at which the potential gradient is about 30 kV per cm., and air becomes a perfect conductor. So far as the cloud is concerned, it has been confirmed by experimental investigations carried out by Dr. Simpson and others that it is a good insulator.

A complete reversal of the standard belief naturally follows, and we have to think of clouds as insulating bodies travelling in the conducting medium of air. This is the basis of the new theory for the explanation of lightning.

Generation of Electricity

"What accounts for the presence of electricity in the sky?" is a common question the answer to which is by no means easy. It has been shown by Lennard that electricity is generated when pure water splashes over a solid obstacle, the water particles carrying the positive charges while the negative charges remain suspended in air. Dr. Simpson carried out a series of experiments and was led to the conclusion that a similar generation to that obtained by Lennard occurred when a large drop of water is split up into finer drops, and that drops of different sizes attain certain limiting velocities in still air.

The highest of these velocities is about 8 metres per sec., corresponding to a drop diameter of 5 mm., after which drops of larger diameters will become unstable and hence split up into smaller drops. It is, therefore, clear that water cannot fall in a stream of air whose vertical component is greater than 8 m. per second, because finer drops will be blown upwards and the larger drops will be broken into smaller ones.

It is generally suggested that air currents are characteristic of all thunderstorms, and at those regions at which the vertical component of the wind entering the cloud is 8 m. per sec. rain cannot fall. It is clear that above that region of the cloud water accumulates which will be positively charged. A given mass of water may be broken up several times before it falls and hence may be highly positively charged. The air with its negative charge passes into the cloud which absorbs from it the negative ions.

Types of Discharge

Three cases of discharge are possible, namely, between positively and negatively charged portions of clouds (referred to as sheet lightning); between positively charged portions of the cloud and earth; and between the negatively charged portions of the clouds and earth. The second and third are by far the most important as it is these which cause human injuries and structural damage.

The difference between these two types of discharge is as follows. Discharges from positive clouds to earth start high up in the atmosphere and branch their way to earth. Hence, an object on the earth may either be struck by the main trunk of the stroke or one of its branches. On the other hand, a discharge from negative clouds to earth starts from objects on the earth and branches out as it advances towards the cloud. The reason for the branching is that electricity always follows the easiest path between any two electrodes. It is clear, therefore, that the chances of damage due to lightning strokes are greater with positive discharges than negative ones, but for the same quantity of discharge the latter type of stroke is more severe than the former.

The effect of the current on the human system is similar to that occurring from electric shocks due to "live" apparatus. The two main theories explaining how death may be brought about are (a) nervous inhibition causing the arrest of either the respiration or the heart, and (b) immediate cardiac paralysis due to direct action of the current on the muscle fibres, producing a form of tetanus.

Superficial burns, which map out the course taken by the lightning, often appear on the skins of persons struck. The traces are very clear and often appear in arborescent form, indicating a severe stroke. Other burns known as "surface burns" are found beneath metal articles worn by persons struck, e.g., coins, watches, &c. It is the arborescent burns, taking the form of forked lightning as seen in the sky, that are the more dangerous to life and property.

The Force of Repelled Air

A person struck by lightning has often had his clothes or boots ripped from him. This is due to violent displacement of the air in the vicinity of the object. Thus, when a tree is struck the hollow is blasted. Victims of lightning stroke on recovering consciousness have stated that at the moment when the stroke took place they felt a tremendous blow. This is due to the compressed air pushed before the current.

The treatment of all persons struck insensible by lightning should be artificial respiration, which should be maintained for a fairly long period. The following extracts are taken from the Press report of the lightning effects on a holiday camp. "Only two bricks of the building were dislodged, but these were thrown eighty yards." This was due to the repelled air and gives some indication of its force. "The lightning left marks on our legs resembled the tree branches." This description was given by one of the victims, and indicates the presence of superficial burns. "The pole of the tent was split, and an iron socket in the middle was shattered." The latter point indicates the danger to which a camp is subjected during a thunderstorm.

Wood itself is a bad conductor, yet cases frequently occur of the striking of tent poles. Often these are composed of short lengths of wood connected by iron ferrules or coated with paint containing oxides of iron.

In another camp tents were often struck by lightning, but it was noticed that one was struck more often than the others. Investigation showed that a layer of ironstone existed below the surface of the ground on which the tent had been pitched. Cases in which lightning has struck down a chimney with a fire burning below are due to the mass of hot dry air acting as a conductor. One should therefore keep clear of windows, doors and other places where streams of hot air are present during a thunderstorm.

Motor vehicles are rarely struck and it is thus generally thought that they are immune. The main reason given for this is that the car is directly insulated from earth by its rubber tyres. Actually, in view of the high potential of the discharge, it is unlikely that the tyres will prevent the electricity from entering or leaving the earth, especially when they are wet with rain. The danger is increased due to the exhaust gases trailing behind the car and acting as conductors. A case occurred in which lightning struck the verandah of a house and jumped across to the front of a passing car where it ran to earth. A scorched streak gave evidence of the path of the current, but the driver experienced no shock. Motor cars are just as likely to be struck as other objects, and it is merely a question of good fortune that they are not more often damaged.

Safeguarding Buildings

The main principle involved in the protection of buildings is the provision of means by which discharges may leave or enter the earth without touching non-conducting parts of the buildings. To protect against lightning stroke vertical pointed rods should be erected at the top of the building. At least two rods of copper or iron are necessary for each building; these should be thoroughly earthed. Each rod protects a volume equal to that of a cone whose apex is the top of the rod and radius two to four times the height of the rod. For large buildings horizontal rods directly connected to the vertical ones may be used. This is to approach as far as possible the theoretical idea of enclosing the building in a metallic cage. Use may be made of rain-water pipes and gutters, &c., to accomplish this in a practicable manner. Buildings having metallic roofs should be connected to earth by means of vertical rods.

Gas pipes should be kept away from lightning conductors to avoid danger of fire. Chimney stacks when exposed should be well connected to the nearest lightning rods, as the heated air provides a good conductor for the discharge to enter the building. The lower points of rods should be perfectly earthed in damp soil, preferably near rain-water pipes.

Modern Flour Mill Driving

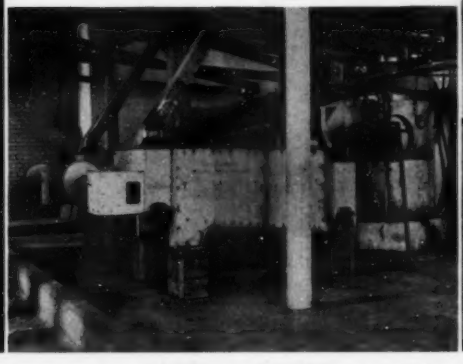
Large group drives essential for sequence continuity of processes

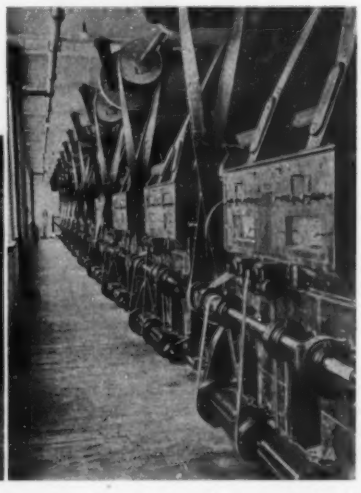
THERE can be no two ways about the system of driving for such an up-to-date flour-milling installation as that at the new Solent Flour Mills, Southampton, of Messrs. Joseph Rank, Ltd., which have been erected on the recently reclaimed ground of the Southern Railway Company's latest docks extension scheme (ELECTRICAL REVIEW, June 22nd, 1934, page 835). Essential sequence continuity of the various operations, dependent one on the other, demands group driving. But the not too engineering mind may be justified in regarding each group of interdependent machines as a whole, thus presenting good examples of large-unit drives.

Electrically the mill may be regarded as in three main sections: that devoted to the removal of the grain from ships at the quayside to the silo, over a distance of 600 ft.; the belt where the grain is dealt with by a cyclone pneumatic separator served by a 10-h.p. motor. From the cyclone the grain is elevated to the storage bins through a vertical distance of 120 ft. by two 25-h.p. motor-driven units.

In the base of the silo the grain is transferred from the storage bins by gravity through suitable valves on to a system of small belt conveyors so arranged that the common delivery to the screening house can be fed from any of the bin delivery chutes. These silo base conveyors have individual 5-h.p. drives.

In the screening house the many processes to which the wheat is subjected include the removal of large impurities and the extraction of dust and chaff in " Eureka " separators; scouring in emery-lined cylinders; screening in rotary sieves;



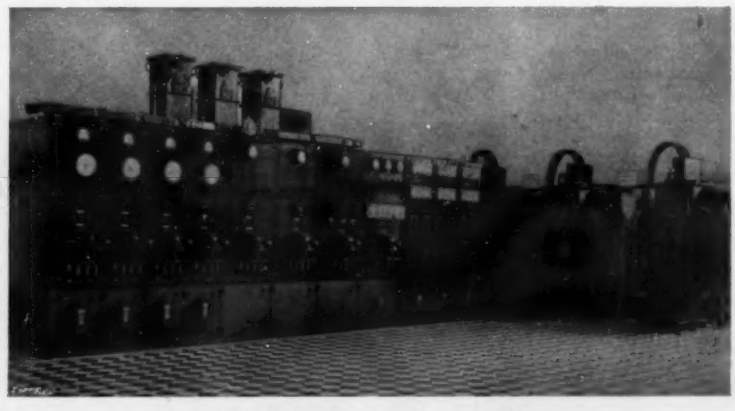


Left: The junction of the main and quayside conveyors at Messrs. Rank's Mills. Centre: Wheat washers and centrifugal "whizzers." Right: A line of purifiers for the removal of chaff and dust

cleaning plant, which prepares the wheat for the grinding rolls; and the mill proper.

Actual removal of the grain from the ship is by suction, for which purpose a Spencer travelling pneumatic intake plant commands about 700 ft. of quay frontage by virtue of rails along the quayside. A 150-h.p. 585-r.p.m. slip-ring motor with an oil-immersed resistance starter drives through helical gearing two vertical vacuum pumps by which the grain is sucked through two flexible pipes and discharged into a receiver with an internal cyclone dust separator and then into a sealed rotary discharger in which the vacuum is maintained while the grain is discharged into a hopper, again into normal atmosphere conditions.

After being weighed automatically on a one-ton Avery equipment the grain is bucket-elevator fed on to one of two belt conveyors located in closed structures on a gantry the length of the intake plant rails. The intake plant is also equipped with a 15-h.p. slip-ring motor for traverse operations; a 6¼-h.p. squirrel-cage motor driving a dust collector; a 5-h.p. s.c. motor which operates the discharge valve; a 5-h.p. s.r. motor driving winches; a 7½-h.p. s.r. elevator motor; and a 1-h.p. unit driving a worm conveyor in conjunction with the dust collecting plant. The suction plant as a whole is electrically served through bare-copper conductors suitably fixed to the quayside gantry structure and roller contact gear on the suction-plant housing.



The l.p. distribution board and transformers

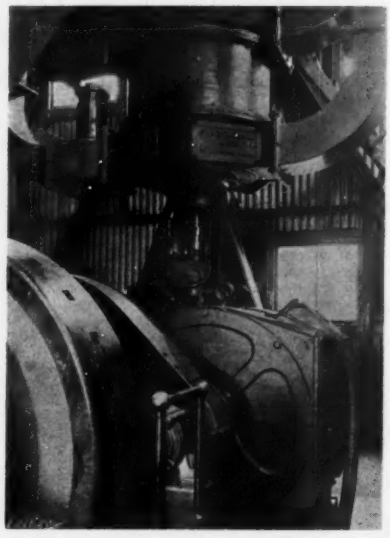
At the meeting point of the two quayside conveyors the junction is completed by the end of a similar and larger belt conveyor 600 ft. long connecting the quay to the mill. At a junction house where the 12½-h.p. motors, driving the quayside conveyors are located, the wheat is automatically transferred to the main belt which is normally fed at the rate of 120 tons per hour. The drive for the main belt is a 24-h.p. motor and gearing and is situated at the receiving end of the washing under high-pressure water jets; drying in centrifugal " whizzers " and also by hot or cold air; grading; separation in equipment with rotating vertical discs in which holes pick up the wheat and refuse such foreign matter as oats and barley; and scrubbing under the influence of large revolving brushes.

Between all these and other operations are sandwiched upward and downward movements of the grain between the five floors of the screening house, and the many small bucket elevators installed for these purposes are an essential part of the self-contained electrically driven system. The whole of this screening equipment is driven by a 200-h.p. slip-ring induction motor, running at 490 r.p.m., with an oil circuit-breaker and a liquid starter all supplied by the Metropolitan-Vickers Electrical Co., Ltd., and the various subsidiary belt drives on the counter-shaft system are accurately designed to afford the correct process speeds at all sections of the plant—a highly creditable engineering achievement.

In the mill proper there are many sets of rolls which individually receive the wheat in its various stages of grinding from one set of rolls to another, thus gradually reducing the ground material in size until finally the exacting requirements of the millers are met. But the wheat does not pass directly between the sets of rolls, for during its passage at different stages, it is subjected to such operations as purifying, dressing and grading. In purifying cabinets particles of bran are removed from the ground mixture by accurately proportioned air currents, and in the centrifugal dressing machines the material is subjected to another form of screening, but to a very fine degree indeed.

As with the wheat in the screening house, the ground material during the various stages of the process is continually elevated and lowered between the grinding and other floors,

and the many wood-cased elevators and chutes which are used for these operations all impart an impression of extreme cleanliness. The milling plant as a whole is driven by a 560-h.p., 6,600-V 250-r.p.m. synchronous induction motor which, with its starting equipment, was supplied by the General Electric Co., Ltd. This main driving unit has a directly coupled exciter and an 8-h.p. starting and barring motor which drives through a worm gearing and a mechanical trip with a counterbalanced handle. The main motor is controlled by a liquid starter and an oil circuit-breaker and the starting motor is provided with a drum-type controller.



Vacuum pump drive in the intake plant

From the main driving pulley fourteen 1¼-in. ropes serve three lines of countershafting in the mill basement which by secondary rope drives distribute the power to the various floors. The main mill driving unit is situated in the power house where there is also a 200-h.p. 400-V M.V. slip-ring induction motor which, with a similar 160-h.p. unit rope-drives the provender mill where maize flaking and similar operations are carried out. Final operations include sacking, weighing, and transport to the quayside or to road or railway. For the last operation we saw in the silo base a short loading conveyor for delivering the sacks to a gantry conveyor connecting mill and quayside in similar fashion to the grain unloading equipment. This small loading conveyor is self-contained with its 12½-h.p. drive.

Electricity is received from the Southampton Corporation undertaking at 6,600 V, 3-phase, and, with the exception of that portion which is taken direct at this pressure by the main milling drive motor, is transformed down for power to 400 V by two 500-kVA transformers and for lighting to 230 V by a similar transformer. A truck-type cubicle switchboard deals with the h.p. supply while l.p. distribution, for both power and lighting, is effected from an open-type slate board. Both switchboards and the transformers were supplied by the English Electric Co., Ltd. Generally, feeding cables go direct to the motor starters or are taken to the lighting distribution boards.

Except where the makes have already been specified most of the motors were supplied by Lancashire Dynamo & Crypto, Ltd., and in places where there is much dust this company's "Fankuld" totally enclosed and externally frame cooled motors are employed. These motors are treated externally with air which is directed over axial ribs by an external fan under an outer end cover.

There are fifty-two motors all told throughout the mill, totalling 1,810 h.p. Considering that the mill is run continuously 24 hours per day through a six-day week this capacity figure represents a very desirable load from the supply company's point of view.

Practically all the motor-starting equipment was made by Messrs. Allen West & Co., Ltd., and the oil circuit-breaker and liquid starter combination is a feature common to the larger drives. Push-buttons for stopping the main drives are situated at many strategic points throughout the mill.

In a research laboratory we saw electric baking ovens and Hearson moisture-content testing equipment. Our thanks are due to Messrs. Joseph Rank, Ltd., for permission to visit the mills and to take photographs, and to Mr. A. Robinson, mill manager, for his assistance in the preparation of these notes.

Opening Park Gates Automatically

A correctly-timed electrical system

THE scheme for the automatic opening and closing of the wrought-iron park gates illustrated is a notable extension of existing methods as hitherto applied to the operation of garage doors. Messrs. Constable, Hart & Co., Ltd., supplied and installed the equipment, which includes a contact mat buried in the drive, similar in design to those which operate traffic lights. A motor car passing over the mat starts an electric motor which is placed underground and this causes the gates to open; after a short period the gates close automatically. An arrangement of clutches enables the gates to be operated at any time by hand. Each gate is 5 ft. wide by 10 ft. high and weighs approximately half a ton.

To fulfil the given conditions the inside and outside contact boxes are connected in parallel in such a way that the motor is started up in the direction required to open the gates. In parallel with the exciting coil of the opening contactor is a time-delay switch of the escapement type, which is therefore energised while the motor is causing the gates to open. A limit switch in series with the opening contactor is operated by one gate on reaching the fully open position, thus stopping the motor and also releasing the solenoid of the time-delay switch.

After a definite time interval, which can be regulated between ¼ and 1¼ min., the delay switch energises the coil of a second contactor which starts the motor in the opposite direction, thus closing the gates, a second limit switch stopping the motor. An electrical interlock is provided so that if, during the closing of the gates, a vehicle passes over the contact strip, thus energising the opening contactor, the closing contactor is released before the opening contactor is operated; this prevents short-circuiting between phases and allows the gates to return to the open position.

The drive consists of a ¼-h.p. three-phase 400-V geared motor with a final speed of 60 r.p.m. This is coupled through a clutch to bevel gearing, giving a reduction of 2½ to 1. The 24-r.p.m. bevel shaft carries a chain sprocket and a spur wheel driving a secondary shaft at the same speed; this also carries a similar chain sprocket. These sprockets, which rotate in reverse directions, are connected by roller chains to a gearbox below each gate. The clutch is normally out of engagement, thus allowing the gates to be moved freely.

On the motor being started, a pump connected to the 60-r.p.m. output shaft delivers oil to a hydraulic cylinder which engages the clutch. There is a time interval of approximately 5 sec. between starting the motor and the first movement of the gates. A small leak in the oil system allows the pressure to fall after the motor has stopped, so that the gates are again free for operating by hand if necessary.

The motor-car in the photograph has passed over the contact mat and the gates are seen to be opening

The closing limit switch is mounted on the top of the motor chamber and the opening limit switch is bolted to a concrete bed in the drive. The clutch, which is of the expanding shoe type, Ferodo-lined, is designed to slip when the gates have reached their extreme position. The time taken by the opening cycle is approximately ten seconds from the time of the car passing over the contact box.

Electricity in Horticulture

By F. E. Rowland, A.M.I.E.E.

TUBULAR electric heaters with thermostatic control are used principally for heating small greenhouses, such as those of amateur growers, in which convenience and lack of trouble make a special appeal. The loading varies with local conditions, but for average circumstances those given below may be taken as a guide. The figures are based on a difference between inside and outside temperatures of 20 deg. F. If only frost protection is required the loading may be reduced by about 50 per cent.

Dimensions of House.			Approximate loading.
Length.	Width.	Height.	
ft.	ft.	ft.	kW
7	5	7	1.25
9	6	7	1.5
10	7	8	2.0
12	8	8	2.5
15	9	8	3.0
20	10	9	4.0
25	10	9	4.5
50	10	9	9.0

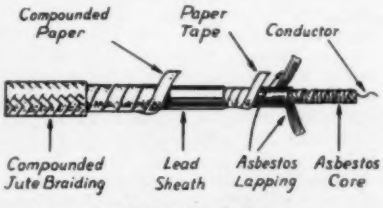
The benefit of electric heating in such greenhouses is reflected by an installation in a lean-to house measuring 13 ft. 6 in. long by 6 ft. 6 in. wide. During the first year's operation the thermostat was set for a minimum temperature of 55 deg. F., when the average cost at ¾d. per kWh for the period from October to March was 3s. 1d. per week. In the following year the thermostat setting was reduced to 45 deg. F., and the cost dropped to 2s. 1d. per week. The lower temperature did not interfere with plant and bloom production. The installation entirely eliminated the worry or trouble that would have been associated with a fuel-fired installation.

Electric Soil Heating

Electric soil heating has been used commercially in this country from about 1930, since when considerable expansion has taken place. The practice originated in Scandinavia, where the long and severe winters make artificial aids for producing vegetables out of season of particular value. In 1926 50,000 lettuces were grown in Sweden in electrically heated frames, while in Norway in 1930 no fewer than 5,235 out of 42,621 garden frames were heated electrically.

The system is chiefly applied to garden frames, although it can also be used for supplementary bottom heating in greenhouses. In the past the principal source of heat for hotbeds was horse manure, entailing the laborious preparation of beds, while to obtain the best results considerable skill and experience are required. The temperature of such beds also falls off as fermentation proceeds, while with the increase in motor transport supplies of manure are becoming increasingly scarce.

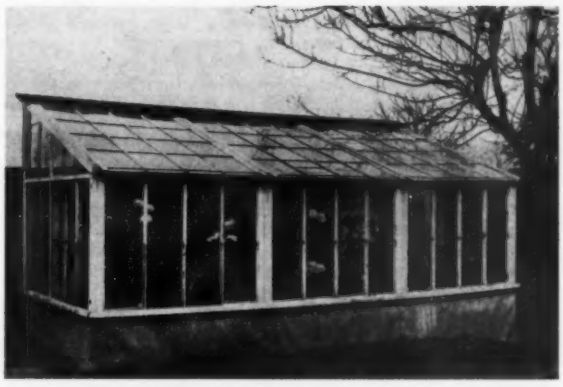
Electric soil heating may be used for stimulating plant growth and obtaining crops at an early date and also for bringing on seedlings and rooting cuttings in nursery gardens. It is also particularly suitable for amateur growers, who are able to have a forcing bed without the labour or trouble with manure. It is worth the attention of electricity supply engineers as a means of securing for their systems useful off-peak loads.



Soil-heating cable

Outstanding advantages of the system are the elimination of labour and management; ease of temperature control; maintenance of temperature at all times; the grower can select any temperature he requires, according to the plant he is growing and the period of growth; an installation is always ready to be put into operation at a moment's notice, and a portion may be used at a time; crops may be grown which would be contaminated by ammonia fumes generated in manure beds; and drainage is not impeded.

The insulated cable used generally takes the form of a conductor of nickel-chrome, "Bright-ray" or similar resistance alloy, insulated with oil-impregnated asbestos and paper tape, and lead sheathed. For protection from corrosion in the soil the lead sheathing is covered with compounded paper tape and jute braiding, and to obtain the necessary loading per foot in smaller sizes, the conductor may be spiralled round an asbestos yarn core. The cable is usually supplied in standard lengths, which provide definite loadings at 200-250 V, *e.g.*, 25 ft., 115 W, 100 ft., 490 W; 150 ft., 700 W. The fitting of tail ends of rubber-insulated copper enables connections to be made in the same manner as with ordinary wiring.



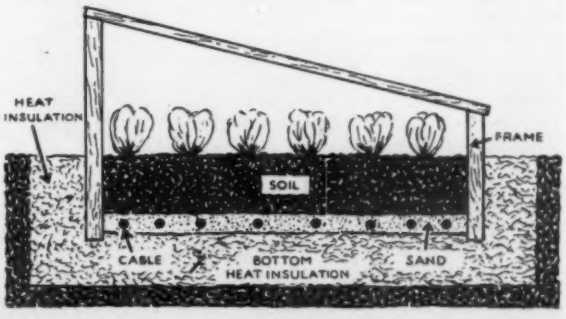
A small lean-to greenhouse photographed early in January

Temperature Control

For small installations manual control of temperature has the advantage of low capital cost, but, as a rule, thermostatic control is preferable on account of increased economy in operation. Thermostats may be either of the rod type, in which the head and an 18-in. stem are integral, or of the bulb type, in which a sensitive bulb is connected to the head by means of a length of flexible tubing. The former has the advantages of being self-contained and robust, whereas the latter in some instances may be more convenient in use, but there is the risk of damaging the tubular connection. For general purposes a temperature range of 40 to 100 deg. F. is sufficient with a differential of ± 3 deg. F., and in large installations the number of thermostats may be reduced by controlling part of the load manually, and only about 50 per cent. by thermostat. Cables are also made with small thermostats permanently connected to them, but no means is provided for varying the temperature setting.

The best method of constructing beds in garden frames is to remove the soil to a depth of about 20 to 22 in. over an area approximately 12 in. beyond the outside of the bed; the bottom and sides are lined with coke, ashes, breeze or similar material to a depth of 12 in. to provide heat insulation, and the side insulation may be banked up round the frame with advantage, particularly in situations exposed to high winds. Over the coke in the bottom of the bed is placed a layer of sand 2 in. deep in which the cable is laid; this also forms a means for distributing the heat which might otherwise remain concentrated round the cable. The bed is completed by filling with soil to a depth of about 6 to 8 in., according to the plants to be grown. When more than one cable is used, they may be staggered so as to facilitate temperature control. Nursery hotbeds for propagating seedlings and rooting cuttings vary slightly in construction, the cable being covered with 2 in. of sand, and the soil omitted; pots and propagating boxes may then be placed on the bed of sand.

When supplementary bottom heating is used in greenhouses over a comparatively large area, the capital expenditure and labour of heat-insulating beds is not warranted and the cables are laid direct in the soil. The benefit of heat insulation is shown from tests conducted at the Institute for Research in Agricultural Engineering, Oxford. With 3 to 4 in. of ashes for bottom insulation a saving of 6 per cent. in electricity consumption was obtained, whilst 11 in. of ashes for side insulation showed a further improvement of 5 per cent.



Lay-out of a garden frame provided with electric soil heating

Waste cork for side filling in place of ashes resulted in an additional gain of 3.25 per cent. Frames should be covered with canvas or sacking during the late afternoon and night when the weather is severe. Such protection has resulted in savings of as much as 7.5 to 11 per cent. in electricity consumption.

A loading of about 10 W per sq. ft. is sufficient for all ordinary purposes with thermostatic control, which besides ensuring an even temperature also serves as a safeguard against overheating in exceptionally mild weather. With manual control a lower loading of about 5 W per sq. ft. is satisfactory, as it reduces the possibility of overheating and also results in greater economy. For cooling-off beds for hardening plants before planting out, these loadings may be reduced by 25 per cent.

The following table shows the equipment in cables which normally gives satisfactory loadings in various standard size

Lights.		Total area.	Cables.		Watts.	
No.	Size.		No.	Length each.	Total.	Per sq. ft.
	ft.	sq. ft.		ft.		approx.
1	3×4	12	1	25	115	10
2	3×4	24	1	25	115	5
2	3×4	24	2	25	230	10
1	6×4	24	1	25	115	5
1	6×4	24	2	25	230	10
2	6×4	48	2	25	230	5
2	6×4	48	1	100	490	10
3	6×4	72	1	100	490	7
3	6×4	72	1	150	700	10
4	6×4	96	1	100	490	5
4	6×4	96	2	100	980	10

frames but allowance must be made for the construction of beds, the extent to which they are heat-insulated, their position, and whether exposed, sheltered or in a greenhouse.

When energy is not available permanently, such as with "off-peak" operation, the loading may be increased so that the temperature of the soil is at its maximum when the current is switched off in the morning. "Off-peak" operation is quite satisfactory because the soil will retain its temperature over a considerable period. The approximate loadings for various running times are as follows:—

Running hours per day ...	8	10	12	16	20	24
Watts per sq. ft.	14	11	9	7	5.5	4.5

Experience shows that to maintain salad beds at 60 to 70 deg. F. during the late winter and early spring a consumption of about 1 kWh per sq. yd. per day is entailed. This varies between 1½ kWh during February and March and 0.5 kWh during April and May, and for lettuces may be expressed in terms of production as approximately one kWh per head during the early spring. Nursery hot-beds require 0.8 kWh per sq. yd. per day during the first sixteen weeks in the year. It has been established that in both cases it is sound commercially to use electric soil heating at 1d. per kWh.

Not only is the growth of plants stimulated and the time taken to reach maturity reduced, but seedlings are prevented from wilting when pricked out and a much higher proportion of cuttings root. Fifty per cent. more plants have been obtained from a given quantity of seeds, with a reduction of more than 30 per cent. in the growing time. Electric soil heating is eminently suitable for the production of vegetables out of season, such as tomatoes, cucumbers, lettuces, carrots and potatoes, and has also been used for mushroom growing with satisfactory results. The introduction of import duties on market garden vegetables has greatly stimulated home production of produce out of season, and electric soil heating offers the progressive grower a means for supplying the early markets.

Sterilising Soil

If soil is used for growing crops continuously it loses its fertility or becomes diseased. In nursery gardens where cultivation is intensive, this deficiency is overcome by changing the soil or sterilising it. A biological characteristic of bacteria in the soil is that harmful organisms are destroyed by raising the temperature to 212 deg. F., but those which are beneficial survive; consequently the effects of sterilising are entirely advantageous when properly carried out. An additional benefit is that seeds are destroyed, with the result that weeds are eliminated.

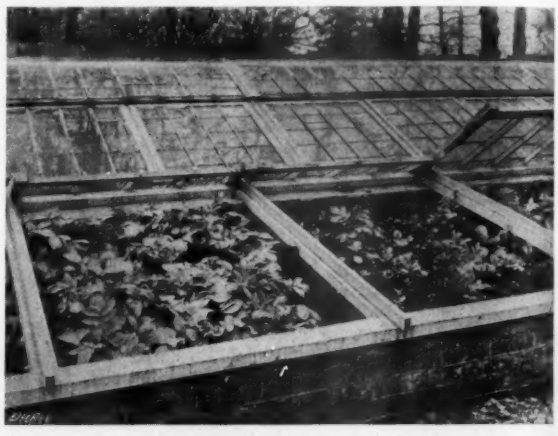
There are three principal methods of sterilising soil, namely, steaming, baking and chemical. Steaming as a rule is applicable only to large areas, as it entails the use of elaborate and expensive plant, consisting of a high-pressure boiler with some form of prongs or forks for introducing the steam into the soil. With baking there is the possibility of moisture deficiency, while the chemical treatment which employs a solution of formaldehyde or a similar agent is not as effective. To obtain satisfactory sterilisation the temperature of the soil should be maintained at 205 deg. to 212 deg. F. for from twenty to thirty minutes.

Electric sterilising has been developed both in this country and in America, the method employed being to pass a current directly through the soil, thus using its resistance to raise the temperature. The equipment, according to its capacity, works on standard single-phase or three-phase supply, and consists of a container, generally made of wood, with metal plate electrodes in contact with the soil. The consumption of energy is approximately 25 to 40 kWh per ton, depending on the nature of the soil and the moisture content, while the process takes about two or three hours to complete. Heating is very uniform and there is no fear of over-heating, because at temperatures over 212 deg. F. ordinary soil is practically a non-conductor owing to the absence of moisture; consequently, the temperature will not rise above the figure mentioned.

Although the present methods of electric soil sterilisation are not suitable for use over large areas, they should afford a convenient and suitable means for small growers and gardeners.

Electro-culture

The term electro-culture is generally applied to the artificial stimulation of crops, either by a high-voltage discharge from overhead wires, or by electricity in the soil. Experiments



Comparison between early potatoes with and without electric soil heating

have been conducted over many years. There are so many variables, not only in the soil, but also due to weather and physiological causes, that it is very difficult to obtain accurate comparative results or to repeat results with any degree of certainty.

Some of the most reliable work on this subject has been done by the Electro-Culture Committee, appointed by the Ministry of Agriculture and Fisheries in 1918. Owing to the variable nature of the results, no report has been published so far, although effects of sufficient interest have been obtained to warrant the continuation of experiments. Some of the first experiments between 1918 and 1922 were carried out on a field scale, but later work has been with pot culture with which it is easier to concentrate on small scale work, with a view to acquiring further knowledge of the effect of such variables as the period and intensity of the discharge, the type of manuring and the physiological effects.

The pot-culture experiments since 1922 have shown that in general a better result is obtained by using the discharge for a period less than the whole growing season, and under the experimental conditions it was found to be most effective when applied for a period of from six to nine weeks in the middle of the growing season. The experimental conditions employed were a treatment for six hours a day, with a moderate unidirectional current of the order of 2.5×10^{-10} A per plant at about 20,000 V.

Early work showed a considerable increase in the yield of spring-sown cereals under certain conditions, but the increase was not obtained economically. Another effect observed is that greater reproductive growth was obtained when compared with vegetative growth, due to a reduction in the percentage of sterile flowers in the ears. Nitrogenous manuring tended to increase this effect. It was also found that there was a slight reduction in the amount of tillering, although there was an increase in the rate of growth of individual tillers, which, however, lasted only a short time.

Keeping Elephants Warm

A new use for panel heating at Whipsnade

THE problem of providing suitable accommodation at Whipsnade for its animals, particularly those not native to this country, is constantly occupying the attention of the Royal Zoological Society. The housing of the elephants is a bigger job than usual in more senses than one. In the first place it is essential that the public should have a good view of the animals, yet at the same time it is equally important that suitable provision should be made for warming the houses in cold weather. The heating question is further complicated by the size of the elephants owing to the "heat shadows" which their bulk produces. In the design of the new elephant houses just erected close to the main entrance to the zoo the architects, Messrs. Lubetkin & Tecton, in conjunction with Messrs. G. N. Haden & Sons, Ltd., have succeeded in finding a solution satisfactory from every point of view. As our illustrations show, the houses, of which there are four, are circular in shape with a diameter of 21 ft., and have in front of them a pool of water 8 ft. deep, which, although acting as an effective barrier between the animals and the public, is yet not too wide to prevent the public feeding them. In front of this pool, which incidentally can also be used as a bathing place for the elephants, are continuous large windows which can be completely closed and still give a good view.

The four dome-shaped elephant houses at Whipsnade Zoo

Several alternative systems of heating were considered before a conclusion was reached as to the most suitable. In the first place a wholly convection heating system was ruled out owing to the excessive rate of air change that might be occasioned by the large door openings, and because of the high running cost as compared with a combined convection and overhead radiation system. High-temperature panel heaters were objected to since it is desirable for them to be spaced 3 or 4 in. away from the ceiling and the convection loss thus created makes the system uneconomical.

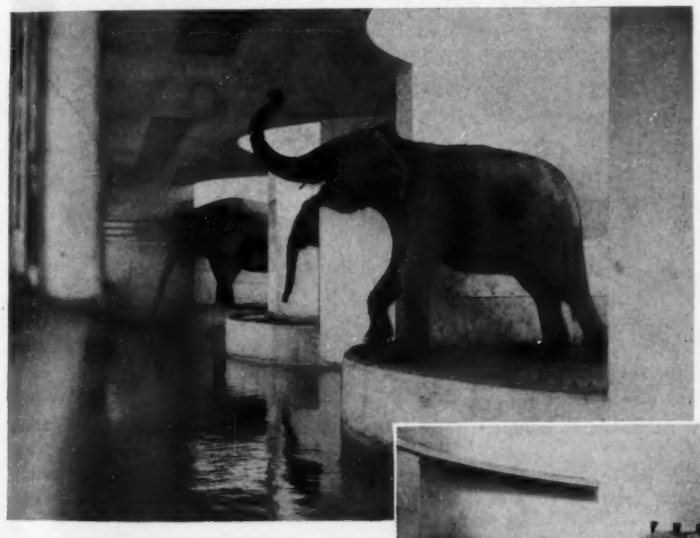
Messrs. G. N. Haden & Sons considered it dangerous to use tubular heaters at the foot of glass screens on account of the close proximity to the water, which might become charged with electricity during the interval which occurred between the occurrence of a fault and the operation of a fuse or circuit-breaker. Although no statistics are available regarding voltages dangerous to elephants it is well known that large animals frequently succumb to lower voltages than human beings. Also unless protected by some very strong metal enclosure (which would incidentally obstruct the free circulation of air), this type of heater would undoubtedly be pulled down by the animals.

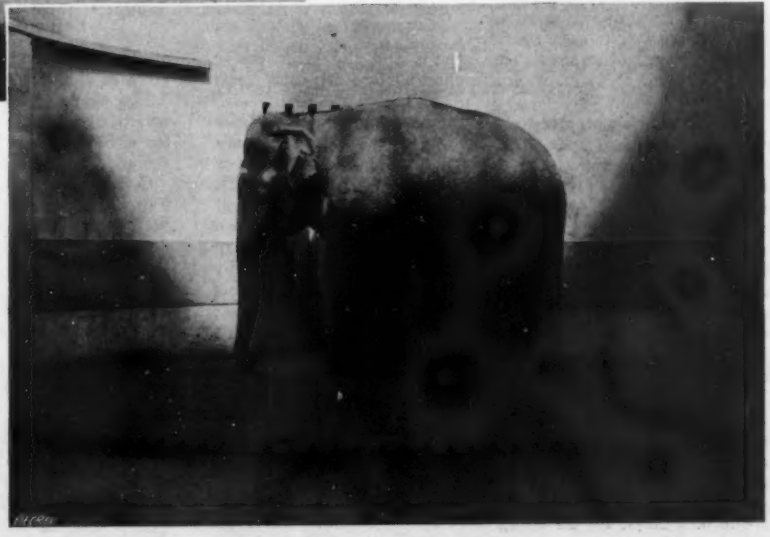
The thermostatically controlled low-temperature radiant panel system eventually adopted lends itself particularly well to incorporation in the modern concrete structure, which safeguards it against destruction by the animals and prevents risk of fire. A sudden lowering of temperature can be quickly counteracted by this type of heater, which also has in its favour its hygienic properties and economy in current consumption.

The installation has been carried out on the basis of an approximate temperature of 60 deg. F., being produced with an outside temperature of 32 deg. F., and with two air interchanges per hour. Allowances have been made for heat losses of both the houses and the glass-sided public shelter which runs along one side. The large size of the animals rendered three distinct sources of heat necessary—in the dome, round the walls and above the water.

The main heating comes from specially designed dome heaters incorporated in the centre of the glass roofs of the houses, and reference to the diagram on page 780 will give an idea of their design. They are approximately 5 ft. 6 in. in diameter and each one, besides housing two panel heaters (with loadings of 3 and 1.5 kW respectively), has in its centre a 150-W lamp with silver-glass reflector and dome heat-resisting glass. Bitumastic paint has been used to coat the heaters to guard against oxidisation caused by condensation, and measures have been taken to prevent excessive heat being carried on to the supporting steel-work and so causing the glass roofing to crack. An easily removable angle ring permits the whole fitting to be lifted out for inspection. The thermostats, which have been placed on the side walls just below the dome, are fitted with heavy perforated guards to prevent damage by the animals.

Owing to the presence of hay on the floors the provision of apertures of any shape or size on the cover-plates of supplementary wall heaters was considered dangerous. The panels were therefore designed specially to obviate



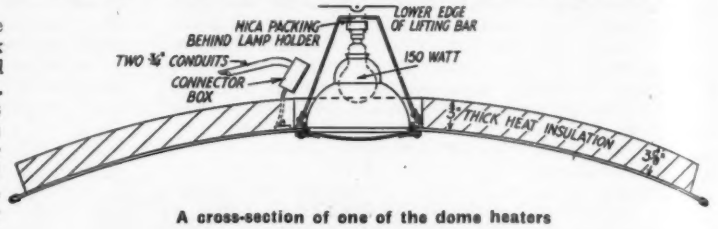


The panel heaters can here be seen above the pool and round the walls of the houses, 18 in. from the floor

the necessity for apertures and were fixed with a ¾-in. cover-plate about 2 ft. from the ground. The face of the heaters was purposely recessed ½ in. from the back of the cover-plate in order to prevent their being shaken by the elephants bumping against the cover-plates. To avoid building up a high temperature in the air gap, the face of the heater and the back of the cover-plate were painted black.

In each of the houses the wall panels have been installed in three sections, that at the back having a loading of approximately 1.5 kW and those at the sides 2 and 0.7 kW respectively. They measure 1½ ft. deep and respectively about 8 ft., 10 ft. 8 in. and 4 ft. wide. The panels situated at the most advantageous positions over the water and between the houses have a total loading of approximately 12.5 kW. For the four houses the total heating load is nearly 50 kW.

A supply of electricity is taken from Luton Corporation at 240/416 V three-phase a.c. The heating panels are divided and wired in 15-A circuits to three multi-way double-pole ironclad fuseboards situated in the neighbouring filter-plant house. The wiring is carried underground between the elephant houses and the fuseboards in lead-covered cables, the wiring of the houses themselves being carried out in screwed steel conduit. Each of the four houses and the shelter is under thermostatic and circuit switch control.



A cross-section of one of the dome heaters

We are indebted to Messrs. G. N. Haden & Sons, Ltd., for the assistance which they have given in preparing this article.

The Earl's Court Stadium

The first section of a million-pound scheme completed

As the first instalment of its £1,000,000 scheme to develop the Earl's Court Exhibition site, Earl's Court, Ltd., has now completed the conversion of the old Empress Hall to a sports stadium specially equipped for ice hockey, boxing and other events. Permanent seats for 7,000 are provided, with an additional 3,000 removable ring-side seats for boxing matches. The whole of the extensive electrical equipment necessary has been installed in less than three months, and includes refrigeration and ventilation plants, public address equipment, electric clocks and an up-to-date illumination scheme.

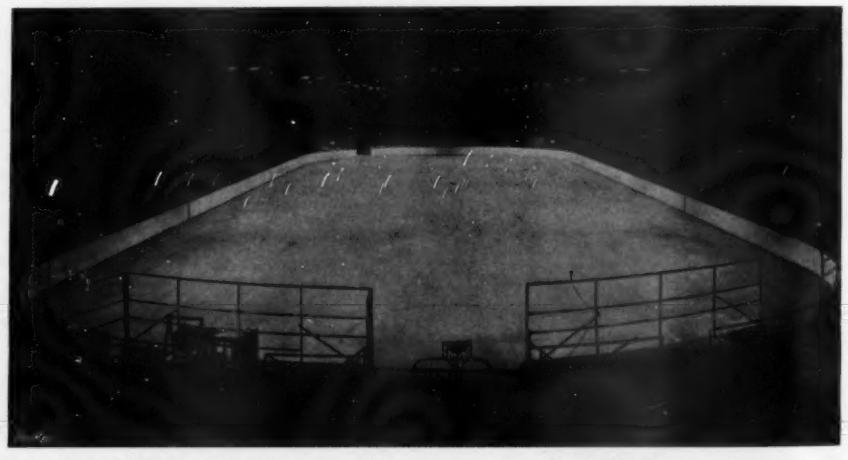
A three-phase 50-cycle a.c. supply is received from the Fulham Borough Council at a temporary transformer house where it is stepped down from 3,000 V to 400 V by two 300-kVA British Electric transformers, six Ferguson Pailin oil circuit-breakers being used.

Throughout the building all the essential plant is duplicated and particular care has been taken to guard against failure of the ice-making apparatus. For this two Haslam ammonia compressors (one standby) are used, driven by 105-b.h.p. slip-ring induction motors. The compressors have 9½-in. by 8½-in. cylinders capable of providing 67 tons of refrigeration each per day. An atmospheric condenser used for cooling purposes enables the same water to be used over and over again, 6-b.h.p. motors being employed for pumping purposes. Duplicate 20-h.p. motors operate the Worthington-Simpson brine pumps and the brine cooler has a diameter of 48 in. with a cooling surface of nearly 2,000 sq. ft.

Mains 9 in. in diameter convey the brine to the edge of the rink whence 1¼-in. pipes, each one easily accessible for cleaning purposes, are set in the concrete flooring in parallel rows 4½ in. from centre to centre. To freeze the whole of the 200 ft. by 97 ft. area about 45,000 ft. of piping is required. Should it be necessary for any reason to thaw the ice the process can be accelerated by by-passing the brine through a heater in the engine room. The refrigeration plant was installed by the Haslam Foundry & Engineering Co., Ltd., and all motors used were supplied by Lancashire Dynamo & Crypto, Ltd., who were also responsible for the motors operating the ventilating plant and the fan for the induced draught boilers for heating the building.

The difficulty of ventilating such a large building as this without dissipating too much of the heat has been overcome by Messrs. J. Jeffreys & Co., Ltd., erecting fresh-air inlets at each end of the building, ventilating plants fitted with special louvres enabling almost complete recirculation of air if desired. The four large fans used are belt driven by 18 and 27-b.h.p. motors, the air being drawn from the inlet ducts *via* filters and hot-water radiators. Entering the hall from the three fan-shaped distribution outlets in each corner, the air circulates and is withdrawn through grilles directly underneath the outlets and then recirculated or ejected. Thermostatic control ensures a constant temperature.

For the general lighting of the arena G.E.C. fittings have been installed beneath the roof. When special illumination is required for hockey matches, &c., twelve clusters of three Strand fittings each containing 1,500-W lamps are brought into service. For boxing events a specially designed fitting consisting of a robust framework arranged to carry sixteen 1,500-W concentrating vitreous enamelled steel reflectors is available. This is winch operated, and can be lowered from the roof for lighting the boxing ring whenever necessary.



Thirty-six 1,500-W floodlights in groups of three are here used to illuminate the Empress Hall, Earl's Court

Stand and emergency lighting comes from concentrating vitreous enamelled reflectors.

The whole of the arena and stand lighting is equipped with winches fitted on the walls, so that the units can be lowered for cleaning, &c. The exit signs are of the box type specially designed and supplied by the G.E.C.

General purpose fittings have also been supplied by Messrs. Falk, Stadelmann & Co., Ltd., and Simplex dust-proof panel fittings are to be seen in some of the corridors. To provide d.c. at 110 V for four Strand projector arcs a 40-kW Crompton Parkinson motor-generator has been installed, while the "Chloride" emergency lighting batteries are charged by means of G.E.C. equipment.

The approach road and the car park are illuminated by a number of 20-ft. standards equipped with "Duoflux" reflectors and 500-W lamps, and also "Wembley" lanterns which are mounted on two-way brackets and equipped with 200-W lamps.

Other electrical features of the building include a Gent electric clock system, a "Paremphonic" public address installation and a large neon sign (supplied by the Strand and Interchangeable Signs, Ltd.), over the entrance. The whole of the electrical work was carried out by Messrs. T. Clarke & Co., Ltd., under the control and supervision of the Hegeman Harris Co. (Inc.), the general contractors.

Private Plants for Garages.

By S. F. Osborne

Determining the overall cost for loads up to 10kW

RECENT developments in Diesel and petrol engine manufacture have led to increased efficiency, and has caused consumers taking a public supply to consider the economics of private generation. Where the price of purchased electricity is high much can be said for private plants on economic considerations, but many consumers are apt to forget the advantages of the twenty-four hour service of the public supply. They regard the ¾d. and ¾d. per kWh quoted by manufacturers as being overall costs (without reference to the capital and other charges) although such figures as a rule represent bare fuel costs only.

Garage owners appear to be most impressed by the apparent efficiency of private plants. This is largely due to the attraction held out that they can use waste oil from car-engine sumps as fuel.

Cost of Preparing Waste Oil

A mixture of as much as five gallons of sump oil with one gallon of diesel or light oil is recommended, and figures of one quarter to one-fifth normal running costs are quoted, although the cost of the sump oil amounts to quite half the cost of new oil before it is ready for use. First, the oil direct from the car sump could be sold at 1d. per gal. before it is filtered. It can therefore be regarded as having that value to the user. Added to this there is the cost of cleaning, which depends upon the degree of filtration required and the load factor of the filter plant. With regard to the first, manufacturers of filter plants quote running costs of 1½d. to 2d. per gallon, depending upon the state of the oil before filtration, to bring waste sump oil up to its original lubricating condition.

The oil as fuel need not be filtered to this extent, and the running costs for the required degree of purification are about 1d. per gal. The capital cost of a filter plant for a 10-kW set working under normal conditions during winter months would be approximately £40. With a consumption of 14,000 kWh per annum, interest and depreciation charges, together with labour costs and overhead charges, amount to 0.45d. per gal. This brings the cost of the filtered oil to approximately 2.5d. per gal.

The running costs can be slightly reduced by the use of a self-filter plant, but unless care be taken to ensure the correct degree of filtration the saving will soon be more than balanced by the increase in running costs of the plant due to increased cylinder wear and loss of efficiency.

The overall cost of the supply per kWh depends upon the load factor of the installation. Details of the installed demand and the consumption at a number of garages have been obtained in order to determine characteristics of the load. The figures given below represent the average consumption of several garages.

KW installed	5	7.5	10
KWh per annum (9 or 10 p.m. closing)	5,000	7,300	9,400
Load factor %	11.5	11	10.7
KWh per annum (all-night service)	9,600	13,200	15,200
Load factor %	22	20	17.4

These figures can be taken as a very close approximation to the consumption for most garages, as in no case did the consumption of any two plants with similar installed capacity vary by more than 15 per cent. There is perhaps a greater variation in the load factors of different power installations, but as this article deals primarily with lighting loads the figures will be unaffected by power-load characteristics.

OVERALL EXPENDITURE.	5 kW	10 kW
First cost	£255	£370
STANDING CHARGES.		
Depreciation at 10%	25.5	37.0
Interest at 5%	13.0	18.5
Insurance	6.0	8.2
Miscellaneous overhead charges	5.0	6.5
Total annual costs	49.5	70.2
Annual costs per kW	£9.9	£7.02
RUNNING COSTS PER KWH WITH NEW DIESEL OIL.		
Fuel oil at 5½d. per gal.	0.690d.	0.640d.
Lubricating oil at 6s. per gal.	0.135d.	0.070d.
Total cost	0.825d.	0.710d.

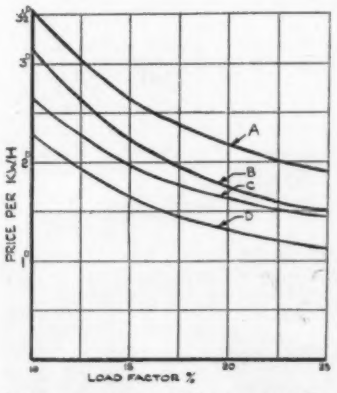
For the smaller set 0.112 gal. and with the larger 0.12 gal. of lubricating oil was used per hour as an average. With filtered oil at 2½d. per gal, the running charges would be reduced to 0.419d. and 0.36d.

These costs are the minimum that could be expected. The lowest amount has been allowed for running repairs and maintenance, since it is generally suggested to prospective purchasers of such plants that there is always a mechanic available who can fill in his spare time on this work.

The accompanying curves show the average cost per kWh for installations of between 10 and 25 per cent. load factor. The capital costs have been taken from the average of three makers, and in every case allowance has been made for an adequate standby battery. It may be argued that a more accurate figure for the life of modern sets would be fifteen years, but there is little doubt that the cost of public supply will be so reduced within that period that it will pay consumers with small generating sets to scrap their plants.

Particulars of power installations have not been included because electricity is usually obtainable from supply undertakings at prices far below that obtained from small Diesel or petrol-electric sets. A battery has been allowed for, since its cost is below that of stand-by plant and below that which an undertaking is permitted to charge for a stand-by supply.

Where a supply undertaking offers flat rates for light and power consumers are tempted to take the supply for power at the low rate and to install a small set to generate their own light instead of paying for it at the higher rate. Thus the overall cost might be below that which would be paid if the whole load was taken from the undertaking. The most reasonable way to deal with consumers who require a supply under such conditions would be to increase the charges for their power supply. I believe that such a differentiation in price would not necessarily amount to a showing of "undue preference" (for the purpose of Section 20 of the 1882 Electric Lighting Act) to the consumer who receives his supply at the lower power rate, provided all consumers who generate their own light are treated similarly.



Average cost per kWh for installations of between 10 and 25 per cent. load factor. A and B relate to a 5-kW set running on new and sump oil, respectively, and C and D to a 10-kW set under similar conditions

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Errors in Reactive Power Measurement

THE true power in a balanced three-phase circuit, with voltage E, current I and phase displacement ϕ, is $P=\sqrt{3}EI\cos\phi$, and is measured by the sum of the readings of the two single-phase wattmeters connected in the well-known "two-wattmeter" method. The difference between the readings of these instruments is $EI\sin\phi$ when the system is perfectly balanced, and the reactive power is then $\sqrt{3}EI\sin\phi$.

In a recent issue of *Revue Générale de l'Electricité*, G. Allaire shows that this method of measuring reactive power is accurate only in the case of balanced voltages, currents and phase displacements. If the voltages are balanced but the currents and phase displacements are unequal, the reactive power as measured by the difference of the wattmeter readings is too great by an amount equal to $2E(I_1\cos\phi_1-I_2\cos\phi^2)$. The true formula for the percentage value of this error is cumbersome, but for small differences of current and phase displacement the percentage error is given very nearly by the expression $115.4\ (\Delta I/I\cos\phi-\Delta\phi)$, where I=mean current; $\Delta I=I_1-I_2$; ϕ=mean phase displacement; and $\Delta\phi=\phi-\phi^2$. Values calculated from this expression are given below:—

PERCENTAGE ERROR IN REACTIVE POWER WHEN DETERMINED BY THE DIFFERENCE OF SINGLE-PHASE WATTMETER READINGS

I_1 A	I_2 A	ϕ_1	ϕ_2	True reactive power, VA (at 100 V)	Error per cent. (approx.)
10.5	9.5	60° 30′	59° 30′	1,482.9	4.6
—	—	45° 30′	44° 30′	1,196	9.0
—	—	30° 30′	29° 30′	827.7	17.5
—	—	15° 30′	14° 30′	403	41
10.5	9.5	46° 0′	44° 0′	1,202.6	7.5
11.0	9.0	45° 30′	44° 30′	1,161.2	21

The important points to be noted are that the error, which is actually somewhat greater than the approximate values tabulated, increases with the current unbalance and is greater (for given phase unbalance) the smaller the actual phase displacement. Even small amounts of unbalance result in serious error. The two wattmeter or watthour meter method should therefore not be used to determine reactive consumption.

High-Speed Trolley Bus Service

WE have had an opportunity of inspecting a single-deck trolley-bus built by Guy Motors, Ltd., for Rotherham Corporation, to meet traffic requirements that are unusually stringent. Acceleration from standing to 30 m.p.h. is made in 14 seconds with full load; the running speed on the level is 40 m.p.h. and on a gradient of one in twelve it is 24 m.p.h. This performance (which has been obtained in practice by the fleet supplied over a year ago with a somewhat different bodywork) results in an overall schedule speed of 14 m.p.h., including stops, which we believe to be the highest figure yet reached in town passenger transport.

The design of the Guy buses embodies many notable features. The first is that the motor is installed at the front, enabling the floor to be lower and permitting the use of a conveniently

One of the new Rotherham single-deckers

accessible circular motor. The liberal dimensions of the latter permit of a large number of turns in the shunt field with a reduction of shunt current to 2 A from the more usual 6 A or so. This makes possible the use of a drum controller which occupies little room, gives smooth acceleration and requires little maintenance.

The compound interpole 500-V motors are rated at 60 h.p. for single-deck and 80 h.p. for double-deck vehicles at 900-2,500 r.p.m. A small series resistance is necessary only at speeds of less than 10 m.p.h. When coasting with the power pedal off, resistance is automatically inserted in the shunt circuit to prevent undue rise in voltage.

The gunmetal drum of the controller is mounted on a square shaft which is linked to the driver's power pedal. In front of the drum are seven spring-loaded fingers which first make contact with the drum and operate the main series contactors, and then progressively close additional contactors, which successively cut out field resistance until full series field is obtained. Eight additional switches progressively divert the series current and speed up the motor. The last four diverting resistances are controlled by switches operated by a low-resistance coil in the main circuit, which also successively opens the switches if the series is too rapidly shunted or if the power pedal is depressed when ascending steep gradients.

Finally, behind the drum are thirteen loaded spring fingers which progressively weaken the shunt field when the power pedal is fully depressed. An important feature of the electrical system is that the shunt field is never broken, thus eliminating inductive voltage rises and permitting the use of cotton covering, which dissipates heat quickly, instead of asbestos.

Regenerative Control

The makers claim to be pioneers of regenerative control of trolley buses and their scheme makes it unnecessary for the driver to feel for the regenerative position on the control pedal as the full amount of regeneration is automatically obtained if the speed of the vehicle is high enough, even if the driver's foot be removed from the pedal. Coasting can be obtained by snapping the foot off the pedal (although the shunt is not broken), but in practice there are few opportunities for free running.

After the vehicle has been slowed down to 12 m.p.h. by regeneration, further retardation is secured by depressing the brake pedal, the first part of the movement in nine steps giving progressive rheostatic breaking which usually pulls up the bus without the further depression needed to bring the mechanical brakes into operation.

A recent development is an automatic current regulating device designed to prevent blowing of the circuit-breakers due to an attempt to accelerate too rapidly. On moving from rest through the series notches the current is limited to that required to give the maximum permissible acceleration even if the power pedal is immediately pushed down through the shunt switches to the full-speed position.

Run-back preventers are operative whether the trolley has become de-wired or not. Compensational four-shoe brakes prevent distortion or unequal wear of the drum. In view of the high acceleration of the trolley-bus the torque transmitted to the back axle is often much higher than that of the petrol or heavy-oil bus. Worm gears with 8-in. centres are therefore used in the back axles with full-floating shafts.

Guy Motors inform us that they have never failed to obtain repeat orders when new vehicles have been required by any of their customers, and among the buses under construction we noticed a batch of double-deckers for Wolverhampton Corporation, which brings the total number of trolley buses of the same make operated by that undertaking up to eighty, apart from an order just received for a further five.

The electrical equipment is made to the design of Guy Motors, Ltd., by the Electric Construction Co., Ltd.

New Books

Alternating Current Practice. By C. H. CLAUDE COOKE. Pp. 247; figs. 93. London: Crosby Lockwood & Son, Ltd. Price 9s. 6d.

This is a handbook for those engaged in electrical installation work, with special reference to the change-over from d.c. to a.c. After an introduction and three chapters on alternating currents, there are three chapters on a.c. motors, followed by one each on transformers, rectifiers, power-factor correction, measuring instruments, and the relative advantages of a.c. and d.c.

The author's aim is to enable wiremen and others "without a sound knowledge of mathematics" to handle (and even to understand!) a.c. apparatus and circuits. Probably it is an impossible task, for the student who requires several pages on cross multiplication before he can extract E or R from the Ohm's law equation is hardly likely to take kindly to the intricacies of polyphase operation and power-factor improvement. Nor is the task a particularly necessary one since there are far more students having all the required technical knowledge turned out by our schools each year than there are jobs to be done.

These difficulties are particularly noticeable in the earlier chapters and lead to a number of confusions and not a few direct mis-statements. Thus on page 11 a *direct* current is said to have reversed and is shown by reversed arrows in fig. vi. What is meant is that the *change* of current has reversed, and this mistake vitiates the whole of the explanation which follows. Again it is not true that when voltage and current are in phase the power has a frequency equal to the supply frequency (p. 33).

The later sections of the book are better, and give a fair though superficial survey of the whole field of a.c. practice. The major difficulty remains, however, and may be expressed by a single example. Regarding synchronous motors the reader is told that the power factor of the load is easily adjusted, without being told either how or why. But such questions are bound to be asked, and the second one, at any rate, is quite unanswerable within the scheme on which the book is framed. The result too often is a string of bald statements as to performances and connections unsupported by any adequate explanation of fundamental analysis. In conclusion it should be stated that the book is well produced and reasonably priced.

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Shorter Notices

"Theory of Machines," by L. Toft and A. T. J. Kersey. (Third edition.) Pp. 436; figs. 276. Price: 12s. 6d. net. "Mercury Arc Current Convertors," by H. Rissik. Pp. 419; figs. 233. Price: 21s. net. "The Surface Condenser," by B. W. Pendred. Pp. 144; figs. 68. Price: 8s. 6d. net. "Training in Industry." Edited by R. W. Ferguson. Pp. 156. Price: 6s. net. London: Sir Isaac Pitman & Sons, Ltd.

"Alternating Current Machinery," by J. M. Bryant and E. W. Johnson. Pp. 790; figs. 541. Price 36s. net. "Relay Systems—Theory and Applications," by I. T. Monseth and P. H. Robinson. Pp. 549 (illus.). Price 36s. net. London: McGraw-Hill Publishing Co., Ltd.

"Fluorescence Analysis in Ultra-Violet Light," by J. A. Radley and J. Grant. (Second edition). Pp. 326; illus. Price 21s. net. "Industrial Electronics," by F. H. Gulliksen and E. H. Vedder. Pp. 245; figs. 245. Price 17s. 6d. net. London: Chapman & Hall, Ltd.

Meetings and Discussions

Glasgow Subway Electrification
Artificial Radioactivity
Modern Railway Signalling

The Electrification of the Glasgow Subway

THE conversion of the Glasgow district subway marks the passing of one of the last cable haulage systems for passenger transport. Mr. W. R. BRUCE is the subway engineer of the Glasgow Corporation Transport Department, and in a paper which he read on December 3rd before the INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND he describes the subway as it was before conversion to electric traction and as it now is.

The reconstruction of the track is outlined as well as the reconditioning of the rolling stock and the stations, while signalling and means of communication are referred to.

The power for the operation of the line is generated at the Transport Department's Pinkston power station at 6,000 V a.c., and a d.c. supply to the subway is given from three adjacent sub-stations at 570 V, each equipped with a traction switchboard housed in a special building on the station platform, and linked together by a ring-main cable. Automatic circuit-breakers on the station switchboards control sections of conductor rail, and a system of knife-switches enable the sections to be fed from either or both ends. Sectionalised control from the stations themselves, by apparatus accessible to the official in attendance, is of inestimable value, particularly in an emergency. The station switchboards also supply power to the station premises for the operation of pumps, hoists, &c.

The existing maintenance workshops were enlarged for reconstructing the passenger rolling stock, which numbers fifty vehicles. The coaches are of the double-bogie type, and a train consists of one motor coach and one trailer coach. The cars are approximately 41 ft. in overall length, with a vestibule at each end 4 ft. in length, and the greatest outside width is 7 ft. 8 in.

The motors are of the nose-suspension type, and are supported by the bolster cross-members suitably sprung to lessen the shock when starting. A current collector is fitted on each traction bogie. Owing to the height of the conductor rail above the running rail, the collector gear had to be of special design, taking the form of a hinged arm carrying a collector shoe. On the base plate of the collector gear which is mounted on, and insulated from, the bogie side frame, are attached springs for maintaining the necessary pressure on the shoe.

Each motor coach is equipped with four 60-h.p. interpole fan-ventilated motors, two on each bogie. To enable the windings of the field coils and armatures to withstand the high running temperatures likely to result from 18 hours' continuous operation, over a route on which heavy gradients are the rule rather than the exception, "Class B" insulating materials have been employed throughout. Helical gearing, with a ratio of 14 to 61, transmits the power from the motors to the driving axles. Remote control driving equipment has been installed, following, generally, the practice adopted on electrified railways.

* * *

Alchemy—A new Method of Approach

IMPORTANT features of the new science of artificial radioactivity were dealt with by PROF. F. PANETH, of the Imperial College of Science and Technology, London, in an address before the Newcastle Section of the SOCIETY OF CHEMICAL INDUSTRY on November 22nd. The production of artificial radio-elements, he said, was the newest development of the old science of alchemy. It was of special interest for the chemist, because up to the present the quantities produced by artificial transmutation were too small for a purely chemical examination. If, however, the newly formed elements were radioactive the much higher sensitivity of electrometric apparatus could be used for a study of their chemical properties, and in this new field the collaboration of the chemist with the physicist was as necessary and as fruitful as in the realm of the natural radioactive elements.

Artificial radio-elements could be produced in many ways; by bombarding the elements with various kinds of rays of radioactive substances; with hydrogen or deuteron particles accelerated by electric fields; with X-rays; and with neutrons. The efficiency of neutrons in transforming elements depended largely on their velocity and was in most cases much increased by slowing down the neutrons by collision with hydrogen atoms. Prof. Paneth demonstrated the activation of fluorine, rhodium and silver, by fast and slow neutrons, and the decay of the artificial radio-elements produced. A few elements, he said, possessed a special facility for absorbing slow neutrons; the neutron-nucleus collision across sections of the elements boron, cadmium and gadolinium exceeded those of other elements by factors of approximately 300, 3,000 and 30,000, respectively.

Among the many interesting features of the new science of artificial radioactivity were the creation of at least one new radioactive series and the production of elements of higher atomic number than uranium. On the practical side artificial radio-elements might be used in the same way as the natural ones as indicators in the study of many chemical, physical, and biological problems; for example, the phosphorus metabolism in rats had recently been investigated by this method. The ease with which, throughout the periodic system, elements could be experimentally transmuted went far towards clarifying ideas about the way in which the creation of the natural radioactive elements as well as of the stable elements had taken place.

* * *

Modern Railway Signalling Methods

THE considerable developments that are taking place in the use of electricity for railway signalling are described in the paper by Major L. H. PETER which was read at the INSTITUTION OF ELECTRICAL ENGINEERS in London on December 5th. The author says that the number of signal cabins in use has been reduced, not merely in isolated cases, but as a large movement. Most of the railway groups in this country have reduced their cabins by several hundreds, and each has been replaced by electrically operated apparatus, purely on economic grounds.

The use of code transmission has been introduced into a number of systems for the control of signals and points, cab signals, track circuits, and train description. The mechanically interlocked lever frame is giving place to electrical interlocking, and in some cases thumb-switch control is being used.

Returns of maintenance costs for 1933 show that the railways of Great Britain spent £1,687,164 under this heading, which includes both power and mechanical signalling, and one railway company has made a saving of £90,000 per annum by closing 200 signal boxes and installing modern signalling. Another railway has shown an annual saving of £97,000, representing a return of roughly 20 per cent. on the capital expenditure, by the same methods. This progress will need still more attention being given to the education of maintenance staffs.

Regarding reliability, the unit failure figure for 1934 corresponds to about 16 years' operation of a unit without failure. On some of the lines controlled by the L.P.T.B. the figure is nearly double, *i.e.*, about 30 years. A number of these failures are due to causes not directly attributable to signal apparatus. There seems to be justification for further extending the use of track circuits and train control on the grounds of both safety and economy.

An analysis of the Class A accident reports for the years 1926 to 1934 inclusive covers 143 cases. Of these investigations seventy-five were reported on as requiring some improvement in signalling. In twenty-eight of the seventy-five cases the report states that the accident would have been prevented by automatic train control, and in twenty of the seventy-five cases the installation of track circuits was recommended by the inspector.

The substitution of remote electrical control for local hand operation involves the use of highly efficient point-moving and signal mechanisms, since the cost of power obtained from batteries is seldom less than 15s. per unit. As mains power supply is seldom available within economic distance of the points and signals to be actuated, primary batteries have to be used. The air-polarised Leclanché type of cell is employed for preference on account of cost, and in some cases secondary cells kept charged from primary cells form the battery for point-machine operation. This method has the advantage that the momentary 5 to 8 A at 30 V required for a point machine can be provided from the secondary battery, and as the number of operations per day in these outlying installations seldom reaches fifty, and the operation lasts only 3 or 4 seconds, there is ample time for the primary cells to re-charge the secondary cells at a rate which allows a long life to the former. Wherever an a.c. power supply is available the practice is to trickle-

charge a secondary battery through a metal rectifier. Cadmium-nickel-iron batteries have proved quite satisfactory for this class of point-machine operation.

Railway signalling is a potential load for supply authorities. All modern signalling takes in power at the standard voltages and frequency and provides a 24-hour load which for practical purposes is constant and, therefore, attractive. Actual consumption is about 400 kWh per annum per lever in large terminals having from 100 to 400 levers installed. Lengths of automatic signalling vary greatly in power requirements, the d.c. track circuit fed from a trickle-charged battery and rectifier being very economical. Light signals of the multiple-aspect type require about 25 W per signal, and searchlight signals from 4 to 12 W. The power factor of signalling loads is good and it is common practice to load capacitance along distributor cables at intervals to maintain this.

While it is becoming easier to get a supply of electricity in most stations it is not always so easy to get a supply at each signal cabin and signal post, but each of the latter is a potential customer for the supply authority. The signal engineer must always consider reliability of the source of supply as a primary factor, as a failure of even a minute or two is sufficient to cause multiple traffic delays, and in the case of light signals a failure of supply may mean loss of the red light protecting against entrance of a train into an occupied section. In some cases two supplies have been taken from independent authorities adjacent to the railway, but in such cases care has to be taken to ensure that the supplies are from independent prime movers and not merely from independent distributors both relying on the same primary supply.

On steam railways where d.c. track circuits are used, a secondary battery at each track, signal, point, or cabin, provides satisfactory reserve against power failure, but where a.c. track circuits are used the general practice is to install small petrol- or Diesel-engined alternators with automatic starting gear. These small sets can be brought into action by a reduction of either line voltage or frequency and seem able to take the load satisfactorily within half a minute of the failure.

The type of stand-by equipment which employs a continuously running flywheel that clutches on to a petrol set on failure of the main supply is attractive in that the delay period can be shortened, but there is the disadvantage of continually running machinery. Whatever form of stand-by set is used it is essential that it should operate on load for at least some hours each week.

As signalling circuits are usually operated at 110 V (a.c.) from main distributors at 400 or 600 V no elaborate switchgear is necessary, and all distribution is carried out through cartridge fuses. A modern signal cabin with 200 levers will probably contain 15 miles of vulcanised-rubber or "ite" class cable of about 1/.064in. size. Cabling between the cabin and the outdoor apparatus varies with local conditions; paper-insulated, lead-covered and armoured cable has come more into use, but the majority of work is still being carried out in wooden trunking except on the L.P.T.B. system, where lead-covered vulcanised-rubber cable is used throughout. Multi-core armoured cables, where used, have necessitated special joint boxes to break up the main cable run into a number of smaller runs. In hump sorting goods yards buried cable runs are desirable to allow packing of the permanent way without disturbing cables. Internal wiring in signal-interlocking frames is now commonly carried out with flameproof-covered wires run as much as possible in open positions where they are always visible.

The 110-V network has both poles insulated, and it is common practice to use an earth detector connected between each line and earth for indicating when the insulation of either side drops below a predetermined figure.

* * *

Relays and Contact Makers

At the informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS which was held in London on November 26th Mr. N. C. SMART opened a discussion on "Light Current Applications in Heavy Engineering," dealing with devices ranging in capacity from 100 mA at 50 V. The speaker pointed out that safety provisions had increased the complexity of power transmission and distribution, and intricate control had called for delicate contact-making devices small in size but relatively low in cost. Power distribution networks and feeder protection was not the only large field employing light current devices. In addition to communication engineering, where their use was very extensive, railway signalling, street-lighting control, street traffic signalling and the operation of lifts and hoists were additional fields in which their use was steadily growing. The standard relay could break one ampere, but with inductance complications arose. The speed of the relay was about 7 milliseconds, but if extra-rapid operation were required half a millisecond was obtainable, while there were selectors in service travelling 200 steps per second.

* * *

Studio Acoustics

The acoustical design of radio studios, based on the experience of the British Broadcasting Corporation, is considered in the paper by MESSRS. H. L. KIRKE and A. B. HOWE which was read before the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on December 4th. The authors describe the progress attained on a historical basis.

The purpose of the paper is not so much to record the results of any precise measurements or research involving a high degree of scientific accuracy as to give an account of the experience gained during several years' work in which considerable use has been made of instrumental methods in the measurement of the reverberation/frequency characteristic of completed studios and of the approximate sound-absorption characteristics of the materials available for studio treatment. To that extent results are quantitative, and many of them can only be explained on the basis of certain hypotheses, which have been accordingly adopted from time to time as a suitable basis for further progress.

Such a state of affairs has obtained particularly in relation to the effects of resonance on studio acoustics, in connection with which a fairly comprehensive theory has been built up largely on a qualitative basis. In some cases theory has been tested by direct experiment.

A description is given of the reverberation room and equipment for the determination of the sound-absorbing characteristics of materials available for acoustical treatment. As a result of these measurements, building-board was adopted as a material for general use. Experience with Broadcasting House studios showed the importance of structural resonance as a factor in studio design and a general discussion of its effect is included.

* * *

The Central Board Criticised

The attitude of the Central Electricity Board towards industry was condemned by Mr. H. MANLEY ROBERTS (chairman of the Western Centre of the INSTITUTION OF ELECTRICAL ENGINEERS) in the course of an address before the West Wales Sub-Centre at Swansea last week. In explaining the reasons why many large users of electricity were unable to obtain their supplies in bulk, Mr. Roberts said it could not be denied that the price per kWh for a supply in bulk was greater than the cost at which most industrial companies were able to generate. The Board was remiss, he continued, in not making a closer survey of the correct geographical positions of its overhead lines in relation to the existing industrial load. The majority of the load in South Wales and Monmouthshire, for instance, lay along a line that ran from east to west about twenty miles north of the coast, and had the existing transmission lines between Swansea and Gloucester been placed so as to correspond with that line then they would have been in a more favourable position than was actually the case. If that had been done there would have been no necessity for the enormous expenditure of capital which the Board had incurred through adhering to the original scheme.

The I.E.E. South-Midland Centre

THERE were over 350 present at the annual dinner of the South-Midland Centre of the Institution of Electrical Engineers which was held at the Grand Hotel, Birmingham, on November 29th. In response to the toast of "The City of Birmingham," proposed by Mr. F. H. Clough (chairman), the Lord Mayor of Birmingham (Ald. S. J. Grey) said that last year £2,000,000 was spent on the electricity undertaking, and at the next Council meeting another large scheme would be put forward. The m.d. was now 220,000 kW and the highest day's output in November was 3¼ million kWh, compared with two millions four years ago. The income during the past five years had increased from £1,900,000 to £2,450,000. Proposing "The Institution of Electrical Engineers," Sir Edward T. F. Crowe (Comptroller-General, Department of Overseas Trade) said that an addition of 25,000 sq. ft. would be available at Castle Bromwich next year for the British Industries Fair, making the total exhibition space 300,000 sq. ft. Earl's Court would be ready in 1937, but Olympia would still be required. He emphasised the importance of the Johannesburg jubilee exhibition which would open next September. Great Britain supplied 75 per cent. of the imports of electrical machinery into South Africa. Mr. J. M. Kennedy (president I.E.E.), responding, drew attention to the ideal field for railway electrification round Birmingham. He considered that an increase in the cost of coal would be justified for providing adequate wages to the miners and that the sale of a very few more kWh per £1 of distribution capital would wipe out the effect on the price of electricity. The chairman briefly proposed "Kindred Societies and Guests," for whom Mr. H. Hobson (general manager C.E.B.) replied, saying that while the output of public supply undertakings had doubled itself in the last seven years, this year's output would probably rival the 15 per cent. increase of 1934. Thanks to the chairman, and also to Messrs. H. Hooper and R. H. Rawll for their work in organising the function, were expressed by Mr. W. Burton (immediate past-chairman).

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

The Value of Qualifications

I would strongly advise "Young Aspirant" to work for the degree of D.Mus. or D.D. Such qualifications would fit him for any eventuality, besides distinguishing him from the common ruck of B.Sc.'s, who, none the less, can command salaries of as much as £200 per annum in the electrical industry. (I did, indeed, know a Senior Wrangler once who was offered as much as £250 per annum, but then he was something of a genius.)

If, however, it is only a good job that "Young Aspirant" is after, and he is not particular about "paper qualifications," he will find B.Sc. (failed) or even Matric. (failed) as good as any other, provided they are supplemented with adequate practical experience. This should comprise at least some homework in applied relativity (sometimes called nepotism) and a short course at the International School of Sycophancy. Above all, however, he should acquire a good handshake and preferably take care to be well connected, since "in the higher appointments other factors of equal, if not greater, importance than knowledge or capability are taken into account by those who engage men." M.A. (CANTAB.).

December 1st.

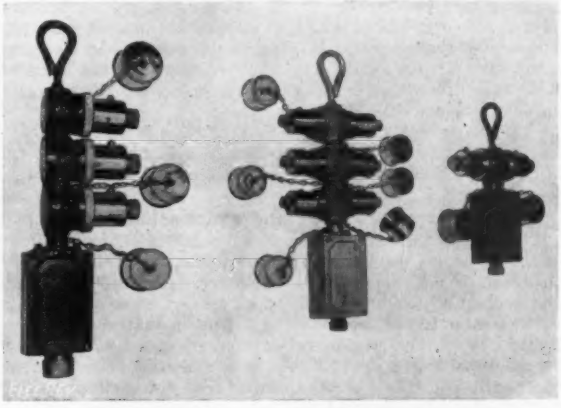
Street Market Lighting

The letter from Mr. P. A. Rayner in your issue of November 22nd raises the very important question of lighting for portable stalls in market places, and it may be interesting to record the experience of Blackburn in this direction.

The Blackburn open-air market is one of the largest in the North of England, containing over 350 stalls and occupying an area of over three acres. General supplies are afforded from six separate supply points whence leads are taken to specially designed multi-way coupling fittings. A three-core 97/.012 c.t.s. cable runs to a four-way distribution coupler mounted on the nearest stall. A supply is given to the row of stalls in alignment with this stall by twin 44/.012 c.t.s., and a feeder loop three-core 65/.012 c.t.s. is taken out to the next row of stalls from which distribution is given as previously described.

The twin- and three-core leads for the local circuits of the stalls are coupled by means of two- and three-way plugs and sockets. The incoming cable is taken through a gland in the bottom of the terminal box and the outgoing supply is distributed through plugs and sockets mounted above the box. The plugs and sockets are of the protected type, made to B.S. Specification No. 196-1930, and are rated at 5, 16 and 30 A. Each plug distributor is fitted with a spring hook at the top to allow it to be suspended from a catenary wire or from an eye-bolt attached to the framework of a stall.

The question of portability and safety is important. The market is actually open on two days of the week only—Wednesday and Saturday—and in order to comply with local by-laws the market must be dismantled by midnight. Stalls have to be taken down, lighting points disconnected, supply couplers and leads packed away until the installation is again required. Naturally the installation is subject to rough usage and some scheme had to be devised to eliminate rough handling, or at least to reduce the possibility of damage. One difficulty was to provide the means for storing away the leads from the various stalls. A plan was devised whereby movable battens were built and insulated lampholders fixed thereon; in addition, the lighting cable for the stalls can be stored in these battens.



Examples of the coupling fittings used

Uniform illumination is obtained by the standardisation of 100-W pearl gasfilled lamps, the total loading for the entire market being over 100 kW. The scheme has now been in operation for a little over three years and was the first of its kind in this country. So far as portability is concerned the scheme works excellently, entailing the minimum amount of handling with the maximum amount of safety, while complying, in all respects, with present-day regulations.

Commenting generally on the installation, the whole layout is not unsightly, and there is very little to be seen of the supply and distribution cable system.

R. H. HARRAL.
Engineer and Manager
Blackburn, *November 27th.* Electricity Dept.

Left: Distribution from a terminal box. Right: A stall showing the lamps mounted on battens

Motor-car Voltages

The voltage drop in car wiring is much more important than Mr. Hemsworth makes out in your issue of November 22nd, and his figures would have been more convincing had he given the corresponding candle-power at the voltages he found.

At 6.5 V a typical 6-V 24-W bulb gives 44 c.p., but the same bulb at 4.5 V, stated by Mr. Hemsworth as the actual voltage on the bulb, gives only 12.5 c.p. On the 12-V set measured in the same way, the voltage at the battery is given as 13-V. The candle-power of a 12-V 24-W bulb at that voltage would be 52.5, and at 11.5 V, given as the voltage on the bulb, the candle-power would be 35.5.

Summarising, with the 6-V set the loss in light through volts drop in the cable would be 70 per cent., and the corresponding loss in the 12-V set 33 per cent., ample justification for 12-V equipment in this particular instance. This loss in the cable becomes more pronounced when higher amperage bulbs are fitted in an endeavour to increase road illumination, when the advantage of the increased current consumption is generally lost by the fall in candle-power on account of the increased volts drop in the cable.

A further point is that the initial efficiency of a lower voltage bulb is reduced by the end losses in the leads, which are heavier, and in the filament, which is heavier and shorter

than in the case with the corresponding 12-V lamp bulb.

With low voltage bulbs for miners' lamps efficiency is very important. After many years of careful study, the B.S.I. Committee and the Lamp Bulb Consultants' Committee of the Mines Department standardised the efficiency of the bulbs of various voltages as follows: 2-V, 5.24 lumens per watt; 2.5-V, 7 lumens per watt; and 4-V, 9 lumens per watt—a gradual increase in efficiency with voltage.

This lower efficiency of 6-V bulbs and the more serious effect of the voltage drop in the cable are responsible for the poor lighting performance of the average 6-V equipment. As Mr. Hemsworth points out, the makers of one British car, apparently realising this, have reduced the loss by making shorter runs with cable of adequate section, but the average 6-V car lighting equipment does not approach 12-V equipment in efficiency or reliability.

EDWIN LYON, B.Sc.(Tech.), A.M.I.E.E.,
Technical Manager,
Barnsley, *November 16th.* Ceag, Ltd.

Neutral Switching and Fusing

I am informed by a supply undertaking that, for a three-phase four-wire installation, a four-pole switch and four-pole fuses must be provided by the consumer. It is stipulated that the neutral switch blade shall make contact before and break contact after the phases. The argument is that although the neutral is earthed at the sub-station an out-of-balance load would cause a rise in potential in the neutral above that of the earth, depending on the distance from the earth plate and the out-of-balance current.

In view of the conditions that apply elsewhere in London, where in many cases a neutral can be taken either through a fixed link or right through from the bus-bars, I should like to know whether the ruling in this case is due in any way to the resistance of the neutral conductor of the network. Also how far does it comply with the Regulations of the Electricity Commissioners and of the Institution of Electrical Engineers?

London, S.E.1, *November 26th.* H. E. JOHNSON.

Cheap Electricity

Referring to the letters signed "Grid" and "R.A.G." in your last two issues, may I suggest that the writers act on the excellent advice given by Mr. A. Regnauld and take up the study of economics. They will then discover that the price of small coal, as that of any other commodity, is governed by the law of supply and demand. Formerly a waste product, only useful to a few consumers who had chain grates, it has now a substantial value on account of the many mechanical stokers installed and the great increase in the use of electricity and gas for cooking and heating. Even now, slacks are sold for less than the cost of production.

There is no question of the colliery owners "forcing up the price of small coal because it is used for electricity generation." The hard fact remains that, unless more large coal can be sold, the only means of producing sufficient smalls will be to crush the large and charge the appropriate price, which will certainly be many shillings per ton more than is being asked at the present time.

If your correspondents would approach their suppliers in a friendly spirit no doubt the reasons for the action of the Central Selling Board mentioned would be more fully explained to them. FAIRPLAY.

November 27th.

"Weoley's" point of view is essentially that of the coal owners, but we have to consider the consumers who want cheap electricity and inquire the reason for its higher cost.

In all my experience of fuel buying, which is fairly comprehensive, I have never been able to force coal owners to sell at an unremunerative price. Their commodity has always, without exception, been offered at their own estimation as to the cost per ton suitable for the quality offered, and the quality often leaves much to be desired.

The miners' wages question should not be the means of causing "panic" prices. Coal is the basis of all industry and the men engaged should be paid accordingly, but coal owners are making their domestic troubles the source of increased revenue.

The Coal Marketing Boards, so far as recent experiences indicate, have not only placed the onus of increased wages directly upon the public utilities, but have seized the early opportunity of increasing previous prices by from 20 to 30 per cent. There is no apparent reason for this, when for years their offers have been at their own estimated values. The Government has erred badly in placing unlimited scope for coal price regulation in the hands of these Boards, regardless of the effect not only upon electricity costs but ultimately upon industry as a whole.

The grid scheme is an entirely different arrangement being designed to cheapen electricity production, not by lowering coal prices but by means of more efficient generation. The Central Board's efforts will be negatived if the Coal Marketing Boards are allowed to raise prices. Generating stations have now reached the maximum of thermal efficiency possible under present design and the benefits have been passed on to the consumer who must now bear whatever extra charges which the Marketing Boards care to fix.

The electrical industry has made every effort, from the generation and selling point of view, to make electricity a cheap and necessary adjunct to domestic life, and to help industries in their trade recovery, and at this point a 20 per cent. increase in production cost is allowed. There is also a danger that there will be future advances to place coal owners on a "sound financial basis." With "Weoley" I pity "the poor defenceless domestic consumer. GRID.

November 30th.

A Defective Installation

I recently visited a house at Gerrards Cross, Bucks, and was horrified to notice the following points in connection with the electricity supply:—A three-pin electric kettle wired with twin v.i.r. cable and relying for its earth connection on the fact that it stood, when in use, on the top of an earthed (?) cooker; a tumbler switch fitted upside down, presumably because wires will not stretch much; a metal lampholder in a bathroom which could be easily grasped by a person in the bath; and a 2-kW fire (only 10 A as the voltage is 200) supplied from a two-pin, non-interlocking switch plug.

May I ask how much longer such things are going to be with us? Surely if intelligent inspection is economically impossible for supply authorities, the matter should be taken up by the Home Office.

Contractors' organisations are no doubt useful from the point of view of notepaper headings and books of ambiguous wiring rules—fine for train journeys—but what do they do to save us from the jobbing electrician or the builder-wireman? I suggest, therefore, that a far more pressing need than a rival to Mr. Therm is a slogan which can be spread throughout the electrical industry and which will "drum" the incompetent installation people out of business. JOHN H. JUPE.

London, S.W.1, *December 4th.*

Public Lighting

I have read with interest the report in your issue of November 29th of a discussion at the Association of Public Lighting Engineers upon the paper read by Mr. E. C. Lennox. I am particularly interested in the recommendation that lighting powers should be transferred to large administrative bodies and that consideration should be given to the suggestion that grants should be made from a central fund to meet the cost of street lighting.

But at the moment there appear to be two divergent schools of thought, both of whom contend they are in the right: (a) The public lighting authority which appoints an engineer specially to advise upon such matters, and bases its findings on the engineering data supplied; and (b) those authorities who instruct their lighting committee to inspect street-lighting installations as a whole and base their decisions upon the results actually seen with the naked eye.

In the former case the efficiency of the installation is usually based upon the B.S.S. mean test point, which, in certain quarters, is contended to be unsatisfactory, due to the fact that the total light to be projected from the lantern remains an unmeasured quantity with the obvious result that any lantern specially designed to project a ray to the B.S.S. mean test points is, in all probability, completely misleading in its total light-emission values.

There is a lot to be said for the latter case, in which the councillors (like the motorist) base their decisions upon what they actually see, and this automatically takes into account road reflection values and colour characteristics, important factors in arriving at a decision regarding the relative efficiencies of alternative installations. E. W. C. DAY.

South Kenton, Middlesex, *December 3rd.*

"The Survival of the Fittest?"

With reference to the article appearing on page 744 of your last issue, it might be good propaganda if a schedule could be prepared of the gas undertakings which have been discarded as a result of electricity penetrating rural areas.

To give our case: since the Corporation commenced to supply in the rural area around Chester in 1925 the following gasworks have been shut down:—Village of Eccleston; village of Aldford; Eaton Hall; village of Tattenhall; and Farndon and Holt. There is a prospect of Tarporley closing down at an early date. S. E. BRITTON,

Engineer and Manager, City Electricity Dept.

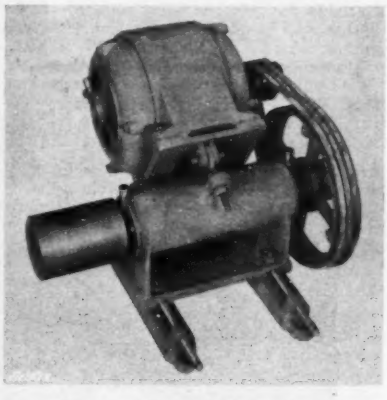
Chester, *December 2nd.*

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

V-belt Reduction Units

MESSRS. BROOK MOTORS, LTD., Huddersfield, inform us that they have recently added another model to their range of vee-belt speed reduction units, 98 per cent. transmission efficiency being claimed, as well as absolute silence. Independent adjustment of the primary and secondary drives is provided and the unit is very compact, as can be seen by comparison with the motor. The new unit is suitable for a speed reduction of 4 : 1 with a maximum output of 2 h.p., although vee-belt reduction units are now made in various sizes up to a maximum of 60 h.p.

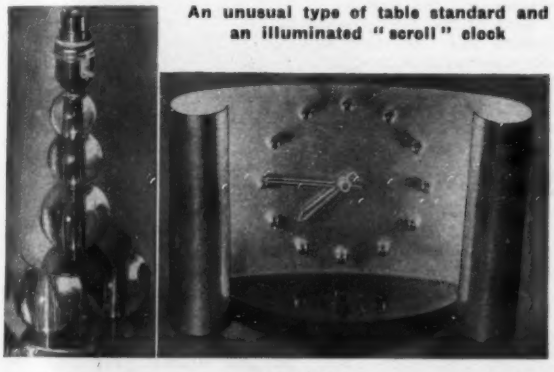


The new Brook reduction unit

Lighting Fittings

During a recent visit to MESSRS. BENNETT & Co., 13, Sackville St., London, W.1, we viewed a large range of modern floor and table standards of unusual design. They are executed in wood, crystal and chromium and anodic finishes. A few examples are illustrated on this page.

Each standard is built up around a centre tube screwed at the top and bottom to ensure rigidity. No solder is used. All bases are weighted and either push-bar holder switches or push-button switches can be obtained. Among the activities of this firm is the manufacture of indirect lighting fittings, wall-brackets, ceiling and tubular lighting fittings. Models are also made to specification, particularly designs prepared by architects.



An unusual type of table standard and an illuminated "scroll" clock

A Lampholder Flasher

The Stanley flasher is designed to plug into an ordinary lampholder, a bayonet-cap being fitted at one end and a lampholder at the other. It is supplied by the manufacturers, the STANLEY ELECTRICAL CO., Latimer Works, Teddington, Middlesex, for 200/250 V, 40 to 100 W, but other ratings can be made to order.

An All-aluminium Wall Bracket

The "Pinup" portable wall bracket lighting fitting made entirely of aluminium is supplied with special pins enabling it to be fixed instantly in any position on the wall. The bell-shaped shade, which is in the form of three separate reflectors giving indirect lighting, is mounted on a swivel, a thumb-screw locking it in the desired position. A switch is incorporated in the head of the shade. The bracket, which is a product of the G. & L. ELECTRICAL SUPPLY CO., LTD., 16, Percy Street, Tottenham Court Road, London, W.1, is obtainable in a wide range of attractive finishes.

The "Pinup" wall-bracket

Dynamos for Commercial Vehicles

For lighting and starting passenger and commercial vehicles a new range of dynamos has been introduced by SIMMS MOTOR UNITS, LTD., Percy Buildings, Gresse Street, Rathbone Place, London, W.1. A 4½-in. diameter model is designed for 12-V working and is capable of a maximum output of 14 A. A voltage regulator causes the charging current to fall off as the battery is charged.

The Simms 5½-in. dynamo

The large output obtainable is due to a design by which sparking and heating are reduced to the minimum and to a system of ventilation in which a small fan at the driving end of the dynamo draws air through the machine and out through apertures in the commutator end-plate. The ventilating holes in both driving and commutator end-plates are covered by aluminium cowls with apertures at the bottom, preventing the entrance of oil or water.

Two types are manufactured. In the first (type 45 DMR) the voltage regulator and cut-out are mounted on the dynamo itself and three terminals are provided. Two of these are the main positive and negative terminals, while the third is for the indicator light on the switchboard. The second type (45 DM) is intended for use with a separate voltage regulator and cut-out and is provided with three terminals to connect to the latter unit. The dynamo cuts in at 765 r.p.m. and gives 14 A at 1,175 r.p.m.

A 5½-in. generator, which is built on the same lines as the 4½-in. model, is made for both 24-V and 12-V. The brush gear, comprising two boxes with their spring carriers moulded into a single block of bakelite, forms a simple and rigid carrier. Only two brushes are used and the armature is provided with a 4-pole wave winding of the simplest kind.

The output of the 24-V model is 17½ A. It cuts in at 835 r.p.m. and gives full output at 830 r.p.m. The 12-V type can be supplied either with a cutting-in speed of 650 r.p.m. (type

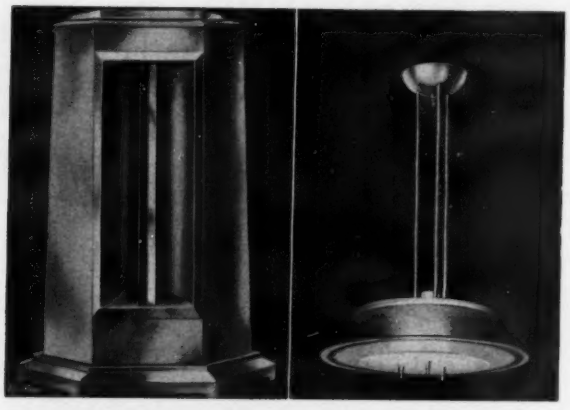
A group of distinctive modern fittings made by Messrs. Bennett & Co.

D

DM) and a full output of 28 A, or with a cutting-in speed of 450 r.p.m. and having a full output of 18 A. This is known as type DL.

New Berry Products

The "Wendy" 1-kW portable radiator and the "Saturn" semi-indirect lighting fitting are two new developments of



The "Wendy" radiator and the "Saturn" semi-indirect lighting fitting

MESSRS. BERRY'S ELECTRIC, LTD., 85-86, Newman Street, London, W.1.

Though inexpensive, the radiator is substantially constructed of sheet steel with a cast base and top, and weighs 8 lb. It is pillar-like in appearance and is 18 in. high, 11¼ in. wide, and 6 in. deep. The vertical wire-wound tubular element is protected by a guard and can be slipped out quite easily if necessary.

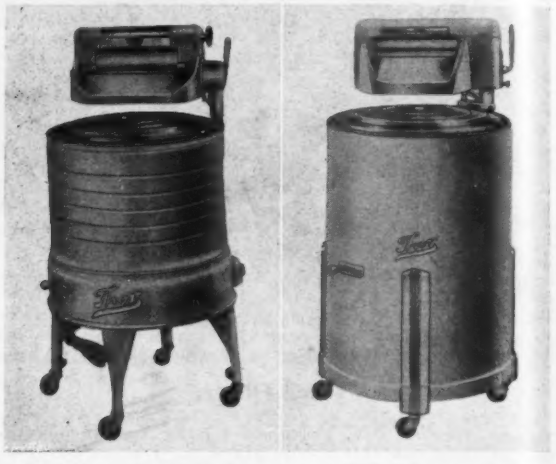
Non-tarnishable white metal is used for the reflector. A hole in the rear of the base-plate keeps the flex out of the way, and for lifting there is a handle at the top which does not get hot. The radiator is available in both oxidised-silver and oxidised-copper finishes.

A spun metal reflector above two separate plate-glass circles tinted in pastel colours provides the rings which give the "Saturn" fitting its name. The underneath surface of the spun-metal reflector provides indirect illumination, while semi-indirect lighting comes through the glass base. Unlike most similar fittings, the "Saturn" is arranged so that the lamp hangs down vertically and can be replaced without taking the whole fitting to pieces. Chromium-plated rods are used for suspension and all the fixing wires are hidden away behind a metal spinning.

Washer Improvements

The HURLEY MACHINE CO. (ENGLAND), LTD., 55, Oxford Street, London, W.1, has just introduced two new types of "Thor" washer and wringer. The "47CP" model differs from its predecessor, the "47," by having an improved wringer with easy-feed aprons and four separate controls available for instantaneous release. It will take 9 lb. of dry clothes and is quiet in operation. "Desert sand" and black enamel provide a neat finish.

A smaller model, the "37P," takes 8 lb. of dry clothes, and



The "47CP" and "37P"—two new "Thor" combined washers and wringers

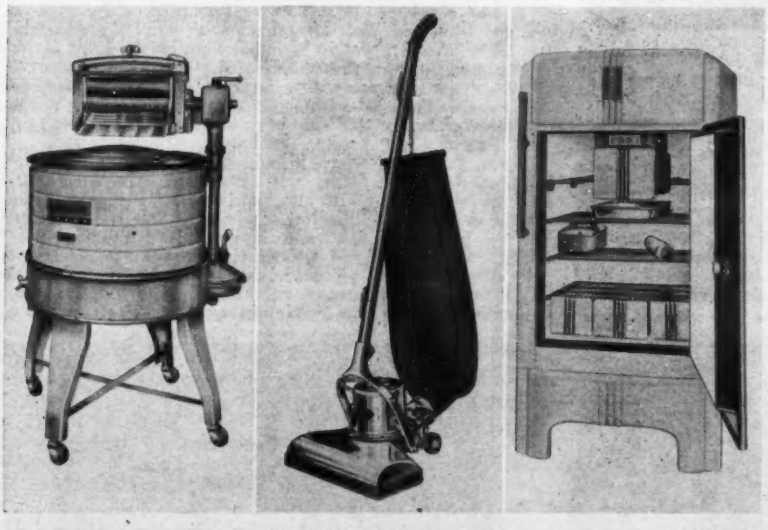
is notable for the "streamline" appearance of both the washer and the wringer.

Both of the machines incorporate "Thor" agitators, ¼-h.p. motors and high-speed non-clogging friction-driven pumps. They occupy a floor space of 24 in. by 27 in. and are designed so that ironers can be attached.

"Kenmore" and "Coldspot" Domestic Products

AS the first of several domestic appliances which it proposes to market in this country the recently formed company, SEARSINT, LTD., Thames House, Millbank, London, S.W.1, is introducing the "Kenmore" vacuum cleaners and washing machines and the "Coldspot" refrigerators.

All the vacuum cleaners are of the universal motor-driven



A "Kenmore" washer (model K3), model 39 vacuum cleaner and a "Coldspot" super-six refrigerator

brush type, with beating, sweeping and suction action. The de luxe model 39 is of moderate price and has as its principal features ball-bearing wheels, simple nozzle adjustment for different thicknesses of carpet, rear compensating movement for uneven surfaces, self-opening bag to facilitate emptying, and a trap to prevent dust falling on the floor when the bag is removed. A lower-priced machine, the "Challenger," model 19, is similar in design, and there is also available the "Junior de Luxe," model 228, which is intended for cleaning stairs, furniture, curtains, cars, &c. None of the cleaners requires oiling and each carries a year's guarantee.

Absence of noise and vibration, thorough and rapid washing, with no wear on the clothes, long life, ease of operation and absolute safety are attributes claimed for the "Kenmore" washers. Both the "K.1" and the slightly more expensive "K.3" hold approximately 6 lb. of dry clothes, and are attractively finished in cream and green. The "K.3" has a chromium-plated safety release bar which can be operated by the slightest touch of the fingers from any position.

The refrigerators range from the "Standard Four," which is 49 in. high, 24 in. wide and 27 in. deep, and has a good storage capacity of 4.31 cu. ft., to the "Super Six" model, measuring 58 in. high, 30 in. wide, and 26 in. deep with a capacity of 6.2 cu. ft. The former has a total shelf area of 9.06 sq. ft. and two ice cube trays (5 lb. of ice) and the latter a shelf area of 13.1 sq. ft. and 5 ice cube trays (7½ lb. of ice). Intermediate models are the "Special Four," "Five," and "Six," which have storage capacities of 4.2, 5.2 and 6.3 cu. ft. respectively. All types are air cooled, thermostatically controlled and silent in operation. The porcelain enamel interiors have easy-to-clean rounded corners and fittings are chromium-plated. Recessed interior dome lights are incorporated. To enable the doors to be opened easily even if both hands are occupied all but the cheapest model have "Touch-a-bar" door openers.

At present the above appliances are manufactured in the United States, but it is proposed to start producing them in this country as soon as the requirements of the market are ascertained. All the company's business is to be undertaken through distributors who will be responsible for specified areas.

Electricity in Hotels

Means of providing increased comfort efficiently and economically

HOTEL and restaurant proprietors who wish to move with the times and provide their customers efficiently with the utmost convenience and comfort, cannot afford not to have complete electrical installations. In this class of establishment, perhaps even more than in the home, it is essential that dirt and fumes should be kept to the minimum, and to accomplish this electricity is indispensable. Even the most sceptical person should be convinced of this by a visit to the Hotel, Restaurant and Catering Exhibition now being held at the National Hall, Olympia, where one of the most attractive and interesting displays has been arranged by the British Electrical Development Association, in collaboration with the Electric Lamp Manufacturers' Association of Great Britain.

Reasons why eyesight is lost or impaired are pointed out, and attention is directed to often forgotten necessities such as bedhead lights, mirror lighting, brackets for corridors and table lamps. Another section of the E.L.M.A. exhibit shows how architectural tubes and other illumination devices may be used for decorative lighting, while a further exhibit comprises a standard range of coiled-coil lamps with a large-scale model showing constructional details and charts indicating the advantages of using only the best lamps.

Two-compartment Jackson grill with stand and illuminated switchgear

Particular interest appears to be taken in the combined fires and slot meters displayed in the heating section of this exhibit, where can also be seen ceiling-type fires for bathrooms, convectors to match various schemes of decorations, inset fires, tubular heaters, and the "Ventiheater" fire which both heats and ventilates. Demonstrations are given of the heavy-duty electric range, cooker and roasting oven, while other exhibits in the culinary section include cookers suitable for boarding houses and small cafés, a service cupboard, fish fryer, waffler, automatic toaster, mixer, potato peeler, and commercial type dish-washing machine.

Water heaters, washing machines, ironers, a refrigerator, counter set, a pedestal hand basin incorporating a heater unit in the base, and illuminated mirrors are other items of interest, and visitors can examine large illuminated photographs and diagrams describing schemes of central and local heating, ventilation and heavy-duty cooking installations.

In addition to the E.D.A. stand a large number of electrical manufacturers have separate exhibits. A complete range of cooking apparatus shown by the Jackson Electric Stove Co., Ltd., includes chefs' ovens, boiling tables, hot cupboards, fish and chip fryers, plate warmers, grillers, steamers, pastry ovens, boiling pans for vegetables and stock pots. Among the Peerless Electrical Manufacturing Co.'s comprehensive display of kitchen equipment are a new small-size combination sausage and mincing machine, a chipper which automatically cuts straight chips the long way of the potato and five new attachments for mixing machines. A bread slicer which is automatically switched off when the end of the loaf is reached is a new product of the "Euk" Manufacturing Co., Ltd., which also has an automatic electric toaster (which switches itself off, rings a bell, and shows a red light when the toast is ready), a bread wrapping and sealing machine and a three-compartment thermostatically controlled dish-washing machine (capacity 2,000-3,000 pieces per hour).

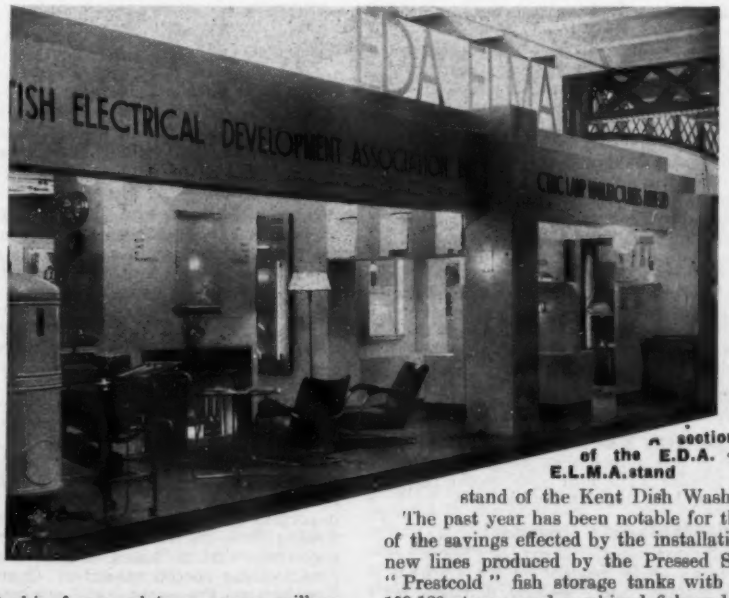
Attractive lighting in the Model Restaurant

Messrs. Reads & Barrons Mixers, Ltd., claim that their potato peeler is the only one having the motor built into the pedestal out of the way of dirt and water. This company's three-speed mixers are supplied from 10-quart capacity upwards. "Reliance" electric freezers and "Convenient" coffee mills are shown by Condrup, Ltd.

Dish-washing machines always attract visitors' attention, and this year they are more numerous than ever. The "Pledge" machine shown by Messrs. Wm. C. Pilcher, Ltd., has the washing and rinsing waters heated to different temperatures by Reyrolle immersion heaters fitted horizontally on each side with independent switching: the wiring is enclosed in a specially designed frame. An 8,000 piece per hour conveyor type machine as supplied for the *Queen Mary* appears on the stand of Messrs. W. N. Still & Sons, Ltd., whose other exhibits include dry-cleaning plant and silver burnishing machines.

Neither belts nor chains are used in the automatic conveyor type dish-washer shown by the Hobart Manufacturing Co., Ltd., the under-carriage being suspended on flexible copper bands to which a pendulum motion is transmitted. Other Hobart kitchen equipments are mixers, peelers, carvers and washing machines for all sizes of glasses.

The "Deluge" 4,000 piece per hour dish-washing machine (Messrs. Dawson Bros., Ltd.) has its first water heated by four 500 W Bray plate-type elements, the rinsing water being raised to 180 deg. by two 6-kW thermostatically controlled immersion heaters; it has a pilot light in the top and a motor-driven pump. Dish-washing and washing machines are also to be seen on the stand of the Kent Dish Washing Machine Co., Ltd.



A section of the E.D.A. - E.L.M.A. stand

The past year has been notable for the growing appreciation of the savings effected by the installation of refrigerators. Two new lines produced by the Pressed Steel Co., Ltd., are the "Prestcold" fish storage tanks with capacities of 50-60 and 109-120 stones, and combined fish and poultry cabinets which are made in two sizes having 27 and 49 cu. ft. dry storage space respectively. For the cooling of bottled drinks and draught beer specially constructed automatic refrigerating cabinets are shown by the Bottle Colding Co., Ltd., and the Lightfoot

Refrigeration Co., Ltd., the latter company also having a complete range of general-purpose "Westinghouse" refrigerators, ice-cream counters and the "Lightfoot-Ellarcold" ceiling cooler for restaurants, kitchens, cellars, &c. The new "Crosley Koldrink" electric bottle cooler (A. J. Balcombe, Ltd.) will hold 120 bottles and consumes only one kWh a day. Zeros (Sales), Ltd., are showing a complete range of their new air-cooled and motorless models. With no moving parts to wear out they require scarcely any attention and are noiseless.

In addition to examples of its refrigerators, soda fountains and milk-bar equipment, Frigidaire, Ltd., is demonstrating air-conditioning plant, which is also displayed on the stand of York Shipley, Ltd. All types of air purifying plant are to be seen on the stand of Ozonair, Ltd., who were responsible for the installation in the Model Restaurant.

E.D.A. informs us that it is indebted to about twenty electrical firms for the loan of apparatus for its stand and also to the London Associated Electricity Undertakings, Ltd., who have provided expert staff. The Association is co-operating with the Culinary Committee, under the direction of M. Boettiger, in a series of special demonstrations. The electrical equipment in the demonstration theatre includes two electric cookers and two water heaters supplied by E.D.A.

Other electrical exhibits include electric radiators of various types (Benham & Sons, Ltd.), heavy-duty vacuum cleaners (Sturtevant Engineering Co., Ltd.), electrically rotated doors (T. B. Colman & Sons, Ltd.), "Paramphonic" radio-gramophones (Keith Prowse & Co., Ltd.), "Empire" trouser pressers (W. T. Driver), and time recorders and clocks (National Time Recorder Co., Ltd.). The exhibition closes to-day (Friday).

In the Courts

IN the Court of Appeal before Lords Justices Greer, Slesser and Scott last week, Messrs. Calvert and Heald, electrical contractors of Lancaster, appealed against an award of Judge Peel, K.C., in the Lancaster County Court of £537 under the provisions of the Workmen's Compensation Acts in favour of Mrs. Eva Ellison, Preston, in respect of the death of her husband, Henry Ellison, an electrician, who at the time of the alleged accident was in the employment of the appellants.

The facts of the case were that on November 21st, 1934, Ellison was working for the appellants at the Lancaster Royal Infirmary in a cutting and whilst so working scratched his head and he died on December 10th, 1934, from conceptive meningitis. The contention of the appellants was that the injury from which the man died was not an accident arising out of or in the course of his employment and, further, that notice of the accident was not given to them as required under the Acts. It was stated that the injury to Ellison's head was a scratch $\frac{1}{8}$ of an inch long and not measurable in width.

At the conclusion of the arguments of Counsel their Lordships allowed the appeal on the grounds (1) that there was no evidence that the injury from which Ellison died resulted from an accident arising out of or in the course of his employment; and (2) that no reason had been shown why notice of the alleged accident was not given to the employers as soon as practicable after it occurred.

Patent Action Postponed

An important patent action brought by Electrical and Musical Industries, Ltd., against Lissen, Ltd., which had been fixed for hearing before Mr. Justice Crossman during the present term, has been postponed until the next Hilary Sittings. The defendants, Lissen, Ltd., are counterclaiming in the same action and as a great deal of technical expert evidence is to be given the case is expected to last several days.

Claim by the Telsen Co.

In the King's Bench Division on November 28th Mr. Justice Talbot had before him an action by the Telsen Electric Co., Ltd. (in liquidation), of Birmingham, to recover from Churchman's, Ltd., of Colchester, £290, the balance of the price of goods sold and delivered to the defendants. The defendants, subject to the right of set-off and alternatively to their counterclaim for damages for alleged breach of contract, admitted the plaintiffs' claim.

Defendants' case was that in June, 1933, a Mr. McNamara and a Mr. Armitage acting for the plaintiffs orally contracted with a Mr. Fielden and a Mr. Churchman, acting for the defendants, who are factors of wireless goods, that in consideration of defendants maintaining a large stock of the plaintiffs' goods the plaintiffs would from time to time give them credit for any part of the goods delivered by the plaintiffs to the defendants which might become obsolete, out of date, or surplus to requirements. The defendants alleged that in consideration of such agreement they ordered from the plaintiffs large stocks and duly honoured the agreement. On December 3rd, 1934, the plaintiff company went into liquidation, at which date defendants said that they had in stock obsolete, out of date, and surplus goods supplied by the plaintiffs to the value of £447, and subsequently to the liquidation obsolete and surplus goods to the further value of £361, amounting altogether to £808. In these circumstances the defendants claimed the right to set-off against the plaintiffs' claim of £290 the sum of £808, or, in the alternative, damages which they laid at £606 for the alleged breach of or repudiation of the contract.

After evidence had been given a settlement of the dispute was arrived at by which it was agreed that judgment should be entered for the plaintiffs for £175 with costs on the claim, and the defendants' counterclaim dismissed with costs.

A Lampworks Manager's Dismissal

Sheriff Burns in Dumbarton Sheriff Court on November 29th issued his decision in an action brought by Mr. Henry J. Osborne against Aurora Lamps, Ltd., seeking damages for alleged unjustifiable dismissal from his position as general manager of the Aurora lamp works. Sheriff Burns found that plaintiff was dismissed without justification and was entitled to damages, and he granted decree for £100, less £18 as rent owing the respondents by plaintiff. He also awarded plaintiff expenses in the action. In his judgment the Sheriff said that Mr. Osborne's contract of employment was to be for seven years, as from May, 1932, respondents having the right to terminate the contract on giving three months' notice, but only if compelled to do so by adverse trading conditions. On December 4th, 1933, the respondents summarily dismissed the plaintiff from their service, and he raised the present action and based his claim on the amount of four months' salary in lieu of notice.

For the summary dismissal, the Sheriff added, respondents sought to justify themselves on the grounds that plaintiff was acting in a manner prejudicial to their business, in that he was meeting and corresponding with a Mr. Downie (the chairman of Wishaw Co-operative Society), who was considering the organisation of a new lamp factory in Scotland, and that he permitted him to view their plant and factory without their knowledge or consent, and, in effect, that this was done as a prelude to becoming the manager of the new factory. They also, in effect, averred that he endeavoured to seduce three of their employés from their service and that he refused to obey instructions of the board and failed to reply to a letter from one of their principal agents though he had been instructed to do so.

At this stage the Sheriff noted that the plaintiff's successor had been appointed before he was dismissed. So far as the evidence showed, these items of justification were not mentioned until the action was raised. On the first charge the evidence showed that if such an act of treachery were established it would justify instant dismissal. The process of lamp manufacture was secret, and the acquisition of skilled men would be an immense asset to a new firm. The Sheriff was of opinion that the attempt to seduce from employment had not been established. He held the plaintiff's dealings with Mr. Downie to be innocent. It seemed clear that the plaintiff's relations with Mr. Downie were two-fold: first, academic, that is to improve Swedish translation referred to in the evidence, and, secondly, to endeavour to get this undertaking, of which Mr. Downie was a local chairman, to buy the lamps manufactured by his employers. Plaintiff was entitled to a bonus on all lamps sold, and it was to his interest to acquire a new customer of far-reaching importance.

It is learned that an appeal has been lodged.

Theft of Electricity

At the Birmingham Police Court on November 29th, reports the *Birmingham Post*, William Martin, Stechford, was sentenced to a month's hard labour for consuming electricity without paying for it. It was stated for the prosecution that although the charge related to a small amount the supply had been taken during a period of four years. The meter had been removed from defendant's house four years ago but the wiring had been reconnected to the mains and the fuses had been replaced.

Salmon and the Galloway Scheme

Lord Mackay, in the Court of Session, Edinburgh, on November 29, heard Counsel in a petition by the Marquess of Ailsa, in which he asked interim interdict against the Galloway Power Co. from taking possession of, demolishing, or in any way interfering with the existing sluices and fish passes situated at the outlet of Loch Doon into the River Doon. It was explained that in 1929 the respondents received statutory power to carry out a work which involved the construction of a reservoir, which was really the enlargement of Loch Doon, by the formation of a dam across the outlet.

In 1802, the petitioner's predecessor sold the land surrounding the outlet from the Loch, but excepted and reserved to himself and his heirs the right to the sluices. Ninety per cent. of the spawning of the salmon in the area took place in the little streams that ran into the Loch, and it was most important that the petitioner should have control of the water flowing from the Loch into the river. The petitioner's complaint was that no notice to treat had been received with regard to these special subjects. Counsel asked interim interdict, because the respondents' workmen were on the spot and the sluices might be interfered with at any moment.

Counsel for respondents said that if interdict was granted even for a short time it would have serious effects on the progress of the work. Later it was stated that pending the settlement of the questions raised the respondents were pre-

pared not to interfere with the structure of the present sluices and the fish passes which ran through them.

The case was adjourned to allow the parties to adjust matters.

A decision against the Galloway Power Co. was given by Sheriff Menzies in Ayr Sheriff Court recently. The action was at the instance of the Fishery Board of the River Doon, who asked that respondents be ordained (1) to construct a salmon pass or ladder at the dam being made by them at the exit of Loch Doon for the purpose of obtaining water power for working electricity generating stations in the county of Kirkcudbright; and (2) not to alter the present dam so as to create a greater obstruction to the free passage of the fish than at present exists, all in terms of the regulations of the Salmon Fisheries (Scotland) Act, 1868.

His Lordship decided that the defences were irrelevant and that the plaintiffs were entitled to the order for which they asked. He did not see why the respondents, because they chose to erect a dam on modern scientific lines, could be entitled to disregard the regulations on that account. He rejected the contention that the respondents' Act had repealed the regulations.

A Disputed Account

In the King's Bench Division on November 27th Messrs. Leonard J. Ive, Ltd., electricians, Watford, brought an action against Coast & Country Houses, Ltd., of Dymchurch, Kent, claiming £258 balance of money said to be due for work done and materials supplied by them to the defendant company between December, 1934, and July, 1935.

The plaintiff's case was that the amount sued for was due as the result of the installation of electrical fittings at the Seabourne Club and dance hall, Dymchurch. The defendant company denied that it was liable, contending that a company called Seabourne Properties, Ltd., the owners of the club, were liable for the money.

After hearing the evidence, Mr. Justice Lewis said there was no suggestion that the work had not been done or that the prices charged were not reasonable. The plaintiff company throughout treated the order as work to be done for the defendant company and nowhere in the correspondence till a later stage was it pointed out to them that the work was ordered not by the defendant company but by Seabourne Properties, Ltd. Of seven payments that had been made on account six were by cheques of the defendant company.

His Lordship said that in his opinion the defendant company was responsible. As there was a question of adjustment with regard to a discount of 17½ per cent., he would give judgment for the plaintiff company for £190. Judgment was entered accordingly with costs.

The Electrical Situation in Australia

A slight all-round improvement

MR. A. W. BURTON, assistant to H.M. Trade Commissioner at Melbourne, has prepared a report for the D.O.T., under the direction of Mr. R. W. Dalton, C.M.G., Senior Trade Commissioner in Australia, on the economic and trade conditions in Australia (Stationery Office, 3s. 6d. net), in which he states that the improvement in general conditions within Australia which was witnessed in 1934 continued in 1935 (the report is to July last) in spite of the fact that the principal producing industries were generally not so favourably placed as in the former season. The chief factor in bringing about improved superficial conditions was an increase in local borrowing for expenditure on public works for the relief of unemployment.

In consequence of the apparent misunderstanding in the United Kingdom of the real position in Australia it seems necessary to repeat that in the most favourable circumstances possible, United Kingdom manufacturers cannot hope to secure again (at least for a considerable time) trade in Australia of the proportions which they regarded as normal before the beginning of the depression. In the first place, the levels then reached were due to abnormal conditions which are not likely to recur for a very long time, secondly, the restrictions on imports during the years 1930 to 1932 gave such an opportunity to Australian manufacturers to consolidate their position that they are now adequately supplying the market with many classes of goods which it was formerly necessary to import, and in which the United Kingdom held a dominant position as supplier.

In this connection it must be understood that all that has been said as to the recovery of Australia means only recovery from the worst period of the depression; a restoration of the situation to the levels of 1928 and 1929 cannot be anticipated for many years to come. Import trade in 1934-35 will reach about £70,000,000, which is the highest since 1929-30, though still about £60,000,000 short of the total for that year.

The situation in the local manufacturing industries has shown a steady improvement since 1931-32, the worst period of the depression. The number of factories in 1933-4 was actually in advance of the total of 22,916 in 1928-29, the peak year in manufacturing, but the number of employed and the value of output do not yet approach the totals for that year, when the figures were 450,482 and £420,445,288 respectively.

The upward movement in the last two years has been due mainly to the low prices of exports and the consequent need for buying as much within the country as possible. Although tariff protection still remains very high, it is doubtful, in the main industries at least, whether much (and in some cases whether any) effort is really necessary in the present circumstances, while currency is depreciated. Many manufacturers admit that they could compete with imports with the exchange alone and without any tariff, and some would go so far as to admit that not even the whole of the exchange was necessary to protect them.

With the costs of manufacturing production relatively high in Australia, it has not been practicable in the past to develop any considerable export trade in manufactured goods, but aided considerably by the depreciation of Australian currency, manufacturers have been looking to the possibilities of developing an export trade in such goods as iron and steel, wireless apparatus, &c.

An analysis of the import trade in the report contains a section dealing with machines and machinery, including electrical apparatus. The total value of imports in this class in 1933-34 was £4,264,733, a satisfactory increase on the 1932-3 total of £3,443,374, though still far below the figure of £14,286,624 for 1929-30. The share of the United Kingdom in the trade has steadily increased—from 49 per cent. in 1930-1 to 51 per cent. in 1932-3 and 56 per cent. in 1933-4, and consequently in many types of machinery in which competition from other countries (especially the U.S.A.) was particularly severe, the United Kingdom is now securing at least half the total trade, whilst in many others her competitive position improved in 1933-4, as compared with the previous year. The following table gives details of the imports in 1933-4 of those items in which competition with the United Kingdom was most noticeable :—

	Total Imports.	Total from U.K.
	£	£
Batteries and accumulators and parts	20,292	6,696
Carbon manufactures of all kinds, including blocks ...	45,973	19,262
H.t. ignition coils	21,010	7,220
Electric heating and cooking appliances	8,825	2,904
Flush plates, connectors, adaptors, wall plugs and sockets, etc.	20,029	9,690
Filament lamps for automobiles	31,400	10,227
Static transformers	3,079	1,339
Vacuum tubes	12,500	3,106
Radio valves	191,122	48,881
Battery eliminators	4,856	711
Radio receivers and parts	49,364	15,348
Electrical appliances not specially enumerated	121,675	61,495

Apart from proceeding with the conversion of further city telephone exchanges in Sydney and Melbourne to automatic working, and the inauguration of an overseas picture service by radio in October, 1934, the principal developments in the last two years have been in connection with broadcasting services. In addition to the four new regional stations referred to in the previous report as having been contracted for, three other stations each with a power of 10 kW, and an ultimate capacity of 60 kW, are expected to be ready for use by the end of the current year. These will be situated near Nhill (Western Victoria), Wagin (in the south of Western Australia), and Dubbo (Central New South Wales). Proposals are also under consideration for the erection of five or six additional regional stations, the cost of which is estimated at between £150,000 and £200,000.

Atmospheric Pollution

Thirty-eight representatives of local authorities and other organisations co-operating with the Department of Scientific and Industrial Research in the investigation of atmospheric pollution met in London recently for the half-yearly conference and received from Dr. G. M. B. Dobson, chairman of the Atmospheric Poliution Research Committee, a report on the progress of the work carried out. The London County Council brought to the attention of the conference the desirability of reviewing the measures which have been taken in this country and elsewhere to obviate the emission of soot, ash, grit and gritty particles from chimneys such as those of electric power stations. Other local authorities emphasised the need of a wider investigation, and the conference appointed a committee to put forward for consideration proposals for investigations to promote the application of remedial measures by industry and to devise a scheme for securing the financial co-operation of the various local authorities.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

The Empire Exhibition, Johannesburg

Indications of the ready welcome which the decision to hold an Empire Exhibition in Johannesburg from September 15th, 1936, to January 15th, 1937, has received, were given by Major C. C. Frye, chairman of the Organising Committee in South Africa, at a luncheon at the Carlton Hotel, Pall Mall, last week, at which Lord Riverdale presided. The Union Government has given its support, South African firms have already taken more than half the proposed industrial hall space, and various towns are erecting special courts, either individually or collectively, while the Government Departments are to occupy a £40,000 building to be erected in the Cape Dutch style. Already the Governments of the United Kingdom, Canada, Australia, Southern Rhodesia and the East African Protectorates have accepted the Union Government's invitation to participate and it is hoped that India, New Zealand, and the Irish Free State will also join in. There has been nothing like this exhibition in Southern Africa before, and although it will not compare in size with those in Britain and other parts of the Empire, Major Frye thinks that it will make up in smartness and quality what it lacks in quantity. From a business point of view no such opportunity of advertising or prestige publicity has yet occurred in South Africa, and most of the 400,000 persons who live within a 40-mile radius of Johannesburg are sure to visit the exhibition several times. It is an official idea that schoolchildren should be taken to see the exhibition by means of special trains and low fares. Space is still available in the Electrical Appliance Section and the London office of the exhibition at 21, Tothill Street, S.W.1, is prepared to give any further information required.

The Scottish Lighting Service Bureau

After having served a very useful purpose for two years at 29, St. Vincent Place, Glasgow, the showrooms of the Lighting Service Bureau of Scotland have been completely reconstructed so that the lighting arrangements and demonstrations now incorporated represent the most efficient examples of modern practice. Foremost among the new features which have been included is a range of fourteen types of lighting fittings embracing commercial and industrial requirements. Such a range of fittings will enable the Bureau staff to demonstrate, easily and quickly, the type of fitting which best suits each type of interior. Another innovation is a luminous grille, composed of shapes representing hearts and spades, in which lamps concealed behind the spades illuminate the hearts which have been surfaced with matt vermilion paint. This same grille admits daylight as well and is intended to show how light and decoration may be combined in restaurants, cinemas, theatres and shops. Examples of direct, semi-direct, general and indirect lighting systems have been arranged, decoratively, as systems of interior illumination for the whole showroom, while examples of cornice and cove lighting are introduced in a pleasing manner. The popularity of the architectural tubular lamp is indicated by its general use on all sides and several methods of using this lamp have been included. Illuminated curtains, doors and canopies have been made prominent features in the general scheme of decoration while the predominating colours are green, pink and bronze. Many interesting demonstrations of lighting principles have been built into false walls which are built out from the main walls. One of these demonstrations enables visitors to determine for themselves how much light they require to read without strain, while a neighbouring exhibit shows how such intensities may be obtained in practice.

Two views of the premises of the Scottish Lighting Service Bureau which have recently been reconstructed

The American Public Utilities Fight

Another stage in the struggle between the administration and the public utility holding companies of the United States commenced last week when, according to the New York correspondent of *The Times*, a suit in equity was filed in the New York Federal District Court by the Securities and Exchange Commission. The Commission is endeavouring to force the Electric Bond and Share Corporation and five of its immediate subsidiaries to comply with the provisions of the Public Utility Holding Company Act. The case is considered as a test of the constitutionality of the new law. The Corporation is stated to control assets valued at £100,000,000.

The Batti-Wallahs' Society

The next luncheon of this Society is to be held at the Hotel Metropole, London, W.C.2, on Thursday, December 19th. The chief guest will be Sir Geoffrey Clarke, C.S.I., O.B.E., managing director of the Telegraph Construction & Maintenance Co., Ltd., who will relate "Some Indian Postal Experiences."

The Glasgow Contracts

At a meeting of the Glasgow Corporation held on November 28th, the recommendation of the Electricity Committee regarding the placing of two contracts in connection with the extension of the Dalmarnock power station were considered. The Committee's recommendation that the tender of Messrs. Babcock & Wilcox, Ltd., should be accepted for £491,045 aroused considerable discussion, and on a vote it was decided to accept the tender of Messrs. Yarrow & Co., Ltd., at £471,040, whose works were situated within the city's boundaries. Bailie McNeill, in seconding the motion for the acceptance of Messrs. Yarrow's tender, said that both the companies in question were of very high standing, but he could not see why the Corporation should throw away £20,000, when they could save it for the electricity consumers. With regard to the tender of Messrs. C. A. Parsons & Co., Ltd., for two 50,000-kW turbo-alternators at a price of £353,770, the Corporation decided to adjourn, for a fortnight, consideration of the Committee's recommendation, so that a full report on all the tenders could be supplied to the members of the Corporation.

Application for Duties on Accessories

The Import Duties Advisory Committee gives notice of applications for increases in the import duties on the following electrical goods (not including the articles contained in sub-paragraphs (viii) to (xii) unless they are of a description commonly used for domestic purposes), whether mounted or not, with or without bases, cases, covers or housings; and combinations of any two or more of such articles:—(i) Adaptors; (ii) bells and buzzers; (iii) ceiling roses and ceiling rosettes, but not including ceiling plates and metal bowl suspensions; (iv) connecting boxes and bases: (v) lampholders; (vi) pushes, pulls and door and window contacts; (vii) time switches; (viii) connectors, including plugs and sockets; (ix) fuse distribution boards with or without cut-out units; (x) fuses, cut-outs and circuit-breakers whether fusible, thermal or automatic; (xi) indicators, pendulum, luminous and call bell types; and (xii)

switches, including remote control switches (relays) and covers and plates for switches. Any representations which interested parties may desire to make in regard to these applications should be addressed in writing to the secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, Westminster, London, S.W.1, not later than December 19th, 1935.

A Radio-Telephone Conference

Following the great success of a radio-telephone conference held a year ago, International Combustion, Ltd., last Friday organised a second conference, this time extending its scope to Derby, Paris, New York, Buenos Aires, Bulawayo, Johannesburg, Capetown, Bombay, Calcutta, Adelaide, Melbourne, Perth, Sydney and Wellington. One of the principal reasons for the conference was to dispel the idea that British firms are less progressive in their business methods than those of some other countries. Speaking from the company's London offices at Aldwych House, Mr. G. C. Usher, managing director, said that the company had more than upheld its prominent position in the steam-raising field, while messages indicating recent developments were also received from Johannesburg, Bombay, Perth and Sydney. Reception was excellent, and the Post Office is to be congratulated on the efficient way in which it carried out the arrangements for this interesting radio - telephone conference.

A G.E.C. display bill showing a selection from the company's range of electrical Christmas gifts

Electricity and Health

How electrical appliances can help to keep people well and good looking is demonstrated at the Health and Beauty Exhibition now being held at the New Horticultural Hall, Westminster. For saving labour and for cleanliness and compactness in the kitchen the "Thor Electric Servant," shown by the Hurley Machine Co., provides a combined electric washer and ironer, radio set, toaster, kettle, coffee percolator, and mixing and beating machine. Modern permanent waving methods are demonstrated, and for improving the complexion and adjusting the functions of the body generally the "Diatatic" Therapy Co. is showing its "electronic short-wave condensator." Other electro-medical appliances, including home ultra-violet-ray, infra-red and radiant heat units, electric blankets, and vibrators, are to be seen on the stand of the Medical Supply Association, Ltd. To eliminate eye-strain the "Anglepoise" adjustable lamp (Herbert Terry & Sons, Ltd.) is of great assistance. The "Empire" trouser press is another electrical appliance shown.

Electricity at the Motor Cycle Show

The hopes that controlled battery charging would be in vogue at this show have not been fulfilled, for although such equipment is exhibited on Messrs. H. Miller & Co.'s stand and is obtainable on some machines, it is not regarded as a standard fitting. The Lucas "Magdyno" has, this year, in place of cobalt-steel magnets, a new nickel-aluminium alloy known as "Nifal" in the magneto portion of the instrument. Shock-absorbing mounting is employed in the new "Altette" horn, which, owing to a special diaphragm construction, has a small diameter. "Anchored-in rubber" suspension is employed now on many of the Lucas batteries, while the Chloride Company employs two sets of helical springs in partial compression for the same purpose. The popularity of coil ignition has fallen back again from 21.6 per cent. to 18.4 per cent. An interesting range of horns and lighting equipment is shown by Bosch, Ltd., and P. & H., Ltd., and instruments are exhibited by the Cooper-Stewart Engineering Co. and S. Smith & Sons, Ltd. W. Canning & Co.'s stand will attract those who are interested in chromium-plating equipment, while rubber goods are to be seen on the East London Rubber Co.'s exhibit. The show closes to-morrow (Saturday).

A Swedish Lamp Patent Action

A legal case which has been before the Municipal Court of Stockholm for nearly three years was recently settled in its first stage. In March, 1933, representatives of the international pool of manufacturers of incandescent lamps brought an action against the Swedish co-operative lamp factory "Luma" on the charge of infringement of two patents belonging to the trust. The court decided that the defendant was to be completely acquitted of the charge, the judge having found that there had been no infringement and, moreover, that one of the patents was invalid. The plaintiffs were ordered to pay 47,000 Kr. costs. It is believed that an appeal will be lodged against the verdict.

A Novel Delivery Van

A new and attractive electric delivery van was put into service by the Poplar Electricity Department last week. The vehicle—a 10-cwt. Wilson electric van, is finished in dark blue and was supplied by Messrs. Bonallack & Sons, Forest Gate. It is fitted with an "Exide Ironclad" battery comprising 24 cells which have a capacity at the five-hour rate of 129 Ah.

The new Poplar delivery van photographed outside the Central Board's local sub-station

The van has a speed of 16-19 m.p.h. with a range of 33-40 miles on one charge. The model cookers, which are hollow and are fitted with doors at the back, form a receptacle for the goods.

New Electricity Showrooms

The Cleethorpes Urban District Council has decided to erect new showrooms for the Electricity Department at a cost of £12,000.

For Sale

Mr. E. J. J. Lane will sell by auction, at 13, High Holborn, W.C., on December 11th, electrical goods and materials.

(See our classified advertisements.)

A Cardiff Engineering Exhibition

The accompanying illustration shows the stand of Ensign Lamps, Ltd., at the recent Cardiff Engineering Exhibition. The chief feature of the display was a machine which held a number of the company's new "double-wreath" traction lamps, and subjected them to severe shocks. These lamps

The stand of Ensign Lamps, Ltd., at the Cardiff Exhibition

withstood over 100,000 shocks before they were taken off. The stand drew considerable attention, and keen interest was shown in the stability of the lamps under this excesive strain.

Australian Duty on Electric Hair Dryers

At a sitting of the Australian Tariff Board inquiring into the duty on electric hair dryers, a witness said that the use of electric hair dryers of the pedestal type imported into Aus-

tralia had increased nearly sixfold during a period of three years. He asked for duties of 35 per cent. British preferential rate, and 50 per cent. general tariff, in place of a general duty of 25 per cent., British machines being at present free of duty. Mr. E. A. Holland, a director of Hilcastle, Ltd., and factory manager of Eugéne (Australia), Ltd., opposed the application for increased duties. He submitted that it was not justified by trading conditions. In his opinion the manufacture of hair dryers in Australia was not economical or advisable. There were approximately 1,700 ladies' hairdressers in Australia, and the total possible sale of pedestal hair dryers was, on the average, two for each establishment.

The Birmingham Salesmanship Competition

In our issue of November 8th we published the results of a competition arranged by the British Electrical Development Association in Birmingham to encourage salesmanship in the staffs of electricity supply undertakings. A luncheon was held in Birmingham on November 26th at which the silver cup and replicas were presented to the winners. Mr. G. R. J. Parkinson, of the Midland Electric Corporation for Power Distribution, Ltd., presided and among others present were Mr. W. H. Hipkiss, director of sales to Vacuums, Ltd., Mr. H. F. Carpenter, clerk and treasurer of the West Midlands J.E.A., and Mrs. A. L. Hayes, area organiser of the E.A.W., who had acted as judges, and Messrs. E. J. Jennings (Birmingham Electric Supply Department), and T. A. G. Margary (borough electrical engineer, Wolverhampton). Mr. Jennings, in expressing thanks to the judges, said that the question of salesmanship was the most vital one to be faced by the industry in future.

Mr. Margary maintained that the salesman's job was to get the full revenue from the capital expended in laying services by selling electricity for purposes other than lighting. The success or failure of the industry would depend on the salesmen's skill.

The Metrovick players in "Pieces of Eight"

Social Events

Each year the gathering at the annual dinner and dance of Messrs. T. Clarke & Co., Ltd., gets bigger and last Saturday the ballroom at the Criterion Restaurant, Piccadilly, had to be taken to accommodate the 200 present. This well-known electrical contracting company will shortly celebrate its jubilee. Mr. A. Hawkins proposed the health of the chairman (Mr. E. J. Clarke) and the toast of "The Firm" was given by Mr. W. H. Bray, who spoke of the chairman's practical and technical knowledge and also of the system whereby the company delegated responsibility to its charge hands. In reply, Mr. Clarke attributed the company's success to its being a happy family and to the instruction given by his brother, its founder, that "whatever you do, do it well." After other short speeches by Messrs. G. H. Robinson, S. T. Heskins, H. Weeks, J. C. Stephens, H. A. Kenneth and Miss Weeks, the rest of the evening was devoted to dancing and a cabaret entertainment directed by Mr. Robinson. Mr. Heskins and the members of the Social Committee were responsible for the arrangements. Mr. Clarke gave each of the ladies present a set of cut-glass grape-fruit glasses.

From November 27th to 30th at the M-V Club Theatre, Moss Road, Stretford, the Metropolitan-Vickers Dramatic and Operatic Society in conjunction with the M-V Orchestra staged the revue "Pieces of Eight," and the house was packed each night. Sketches, dancing, recitations, songs, playlets and ballet were all provided by the company's staff, the production being arranged by Messrs. R. Maddock and H. Matthias. The acting of Mr. G. A. McNeal was an outstanding feature of the entertainment. The unifying elements in the revue, the treasure chest scene and the succeeding pirate scene, were written by Mr. J. W. A. Chorley. The treasure chest contained the "Pieces of Eight," who were "Metrovick" chorus girls. The production of a revue instead of a play was decided upon in an effort to find parts for as many as possible of the ever-increasing membership of the Dramatic Society.

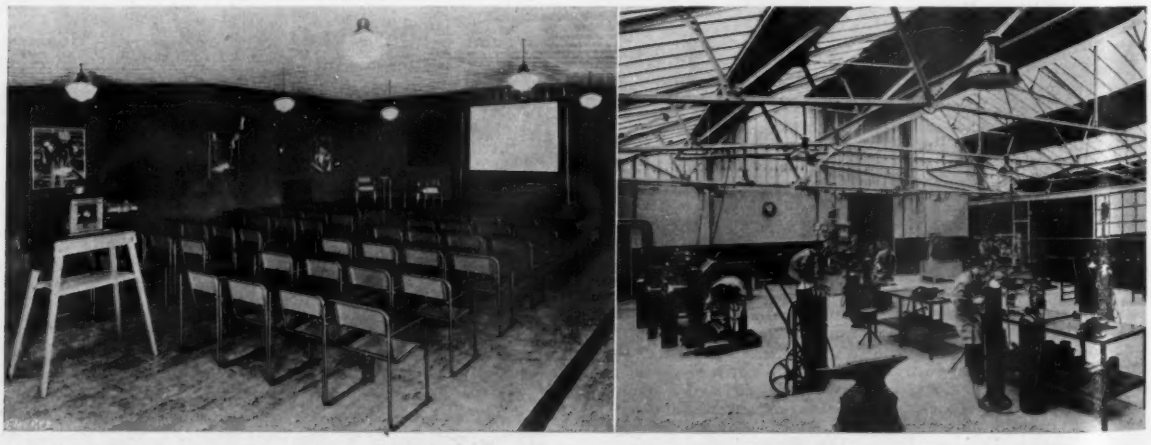
The South Hants Electrical Industries Golfing Society held its first annual supper at the Red Lion Hotel, Fareham, recently. The Society, which was formed in September last, would welcome other members and those in the industry who are interested are asked to write to Mr. E. S. Robinson, hon. secretary, 62, Chessel Avenue, Bitterne, Southampton.

The Practical Electrician's Pocket Book

Nearly 7,000 districts in Great Britain are listed in the guide to mains voltages which forms a large section of the 1936 edition of the "Practical Electrician's Pocket Book," which has just been published. The voltage tables have been considerably extended this year and now occupy nearly eighty pages. Many chapters have undergone extensive revision since the last edition to bring them into line with present-day practice. Among the principal of these sections are those on measuring instruments, switchgear, rectifiers, a.c. motors, automobile applications of electricity, kinema equipment, electric welding, electrochemistry, batteries, steam-raising plant, steam accumulators, prime movers, telephones, electricity in coal mines, portable electric tools, railway traction and radio transmission and reception. The introduction is again contributed by Mr. A. P. M. Fleming, vice-president of the Institution of Electrical Engineers, who sums up the main developments in research and the practical application of electricity during 1935. The Pocket Book is published by Odhams Press Technical Book Department, at the price of 2s. 10d. post free.

A New British Oxygen Service

In concentrating its Sales Technical Service Department at its Cricklewood Works the British Oxygen Co., Ltd., improves its service facilities and makes a useful contribution to the general development of the oxy-acetylene and welding industries. The new premises comprise demonstration shops, a welding and cutting instruction school, a lecture theatre equipped for showing films and lantern slides, exhibition, showroom, and executive offices. Prospective customers may see a complete range of the company's equipment under actual working conditions, and facilities are available for practical tests of different types of equipment for particular jobs. For



The lecture theatre and main shop at the British Oxygen Co.'s new Sales Technical Service Department

purchasers of equipment and their operators, tuition is provided in the Welding and Cutting Instruction School.

A Car Radio Demonstration

A demonstration of the ease with which British-made broadcast radio receivers may be fitted to motor cars, and the good quality performance obtainable on the road, took place last week at the headquarters of Delco-Remy & Hyatt, Ltd., the sole Philco concessionnaires for the motor trade. These sets are made on quantity production lines at the Perivale factory of the Philco Radio & Television Corporation of Great Britain, Ltd., the latest model 803T being a dual-wave set employing a nine-stage superheterodyne circuit with six valves supplied from the car battery. The set is provided with an improved system of automatic volume control and a built-in filter, and the woven metal sheath of the lead-in wire is earthed to the car chassis, beneath which the copper wire aerial is attached. Installation is simplified by the universal mounting arrangement, which needs only three bolts.

Trade Announcements

Vulcanised Fibre, Ltd., who have recently enlarged their premises at Broadford Mills, near Guildford, report greatly increased activity in their export trade.

H. E. Williams & Co., Ltd., have opened new showroom premises for electrical and radio goods at 152, High Street, Colchester.

The district sales office and rubber cable store of Callender's Cable & Construction Co., Ltd., have been moved to larger premises at 90, Mansel Street, Swansea, to which the district contracts office has also moved. The sales office telephone number remains unchanged.

A. Vandam & Co. (1933), Ltd., have transferred their head office to Bridge House, Bexley, Kent (telephone: Bexleyheath 70).

Private Companies

The eleventh edition of "Converting a Business into a Private Company," by Herbert W. Jordan, has just been published (Jordan & Sons, Ltd., 1s. 6d. net). This book explains the advantages over personal ownership of carrying on a business as a company, and the process of conversion.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price, December 4th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£36	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£15 10s.	—
a Potash, Chlorate ... ... per lb.	3½d. to 4½d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 18s.	—
a Sulphur Commercial... ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3¼d to 3¾d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ... ,,	1/2 to 2/9	—
p Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£205	£8 dec.
Grade II ... ... ,,	£141	£6 dec.
Grade III ... ... ,,	£74	£2 dec.
c Brass (rolled metal 2" to 12" basis) per lb.	7¼d.	—
c ,, Tubes (solid drawn) ... ... ,,	9¼d. to 10d.	—
c ,, Wire, basis ... ... ,,	7¼d.	—
c Copper Tubes (solid-drawn) ... ... ,,	10¼d.	—
g ,, Bars (best selected)... ... per ton	£66	—
g ,, Sheet ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£40	—
d ,, ,, Wire Rods ... ,,	£45	—
d ,, ,, H.C. Wire ... per lb.	7¾d.	—
f Ebonite Rod ... ... ,,	1/6 to 2/- plus	—
f ,, Sheet ... ... ,,	1/3 to 1/6 10%	—
n German Silver Wire ... ... ,,	2/5	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para-fine ... ... ,,	6¼d.	¼d. inc.
i Iron, Pig, (Cleveland No. 3) ... per ton	67/6	—
i ,, Wire galv. No. 1, P.O. Qual.... ,,	£20	—
g Lead, English Pig ... ... ,,	£19 15s.	5s. dec.
g Mercury ... ... per bot.	£12 to £12/10	5s. to 10s. inc.
e Mica (in original cases) small ... per lb.	6d. to 1/-	—
e ,, ,, medium ... ,,	5/- to 10/-	—
e ,, ,, large ... ,,	10/6 to 17/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	11d.	—
p ,, ,, rolled strip & sheet ,,	11¼d.	—
p ,, ,, wire ... ... ,,	1/0½	—
o Platinum ... ... per oz.	£7 17s. 6d.	—
d Silicium Bronze Wire ... ... per lb.	8 ¼d.	—
g Spelter ... ... per ton	£15 13s. 9d.	8s. 9d. dec.
r Steel, Magnet, in bars ... ... per lb.	7½d.	—
g Tin, Block (English) ... ... per ton	£223	£6 inc.
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha, and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
i Bolling & Lowe.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

Christmas Presents

Far more useful than some of its issues have seemed to be is the Christmas number of *Good Housekeeping* (E.D.A.). It is devoted almost entirely to excellent illustrations of all kinds of electrical presents suitable for the household. A brief descriptive paragraph of each article and a general indication of price are so arranged as to make reference quite easy.

L.P.T.B. Workers' Wages

The *Times* reports that an immediate increase of 2s. per week in the wages of tramwaymen and trolleybus drivers and conductors on the London Passenger Transport Board's system is announced. The payments will be retrospective as from the first pay week of November. Another increase of the same amount is to be made next October.

New Catalogues and Lists

Brook Motors, Ltd., Empress Works, Huddersfield.—An illustrated art booklet dealing with the manufacture of Brook motors.

Tecalemit, Ltd., Great West Road, Brentford.—Brochures describing a new forced feed oilcan and "Pyramid" oil containers.

Vincent Switchgear Manufacturing Co., Ltd., Sampson Road North, Birmingham, 11.—A catalogue of "Vincent" switch- and fusegear.

Kandem Electrical, Ltd., 711, Fulham Road, London, S.W.6.—A leaflet dealing with a new adjustable bench lighting fitting.

Enfield Cable Works, Ltd., 295, High Holborn, London, W.C.1.—Several lists of braided aerial cables, fuse wires, bell wires, flexible cords, motor car flexibles, shot-firing cables and winding wires.

International Combustion, Ltd., Aldwych House, London, W.C.2.—A catalogue of "Ty-Rock" screens.

Ruston & Hornsby, Ltd., Lincoln.—"Appreciation," a publication showing Ruston locomotives at work and reproducing testimonials from quarry owners, sand and gravel merchants, &c.

Renold & Coventry Chain Co., Ltd., Didsbury, Manchester.—A special catalogue on "ready-to-use" counterweight sets.

Mather & Platt, Ltd., Park Works, Manchester, 10.—A pamphlet on "S" type alternators.

"P. & B." Engineering Co., Ltd., Tamworth Lane Works, Mitcham.—A pamphlet dealing with the company's live line tapping system.

Siemens Electric Lamps & Supplies, Ltd., 38/39, Upper Thames Street, London, E.C.4.—Details of a new study lamp.

Bankruptcy Proceedings

S. Rutland, 39, Hathaway Road, Grays, Essex, electrician.—The first meeting of creditors herein was held recently at 29, Russell Square, W.C.1, when a statement of affairs was submitted showing ranking liabilities of £205, with net assets of £13, and a deficiency of £192. Debtor attributed his failure to lack of capital, keen competition and insufficient profits to cover overhead expenses and personal drawings. The case being a summary one was left in the hands of the Official Receiver, as trustee.

H. A. Sprinz (trading as Howards), 3, Nelson Road, Westward Ho, Devonshire, wireless engineer and dealer in electrical goods, &c.—The first meeting of the creditors herein was held on November 26th at the Official Receiver's Offices, Exeter Bank Chambers, Broadgate, Exeter, when a statement of affairs prepared by debtor was submitted showing ranking liabilities of £934, with net assets of £73, and a deficiency of £861. Debtor attributed his failure to commencing on borrowed capital; insufficient trade; loss sustained on forced sale of goods; and costs of creditors suing. The case being a summary one, was left in the hands of the Official Receiver.

D. V. Briggs (described in the receiving order as Douglas Briggs), Eastwood, Pillmawr Road, Malpas, Mon, lately Austin Friars, Newport, radio engineer.—The first meeting of creditors of the above was held on November 25th at 22, Stow Hill, Newport, Mon, when no statement of affairs was presented. The matter was left in the hands of the Official Receiver, as trustee.

D. A. Bolton, electrical contractor, Palace Chambers, Bridge Street, S.W.—Receiving order made November 26th on debtor's own petition. First meeting December 10th and public examination January 15th at Bankruptcy Buildings, Carey Street, W.C.

N. Ellis (Oxenhope Radio Stores), wireless dealer, Station Road, Oxenhope, and 20, New Road, Denholme.—Receiving order made November 26th on debtor's own petition.

E. G. Williams, wireless and electrical dealer, 37, High Street, Brownhills, near Walsall.—Trustee, Mr. R. K. Clark, 159, Great Charles Street, Birmingham, Official Receiver, released November 20th.

J. Drake, electrical and wireless contractor, 93, St. Leonards Road, Windsor.—Trustee, Mr. J. B. Simmons, 8, Forbury, Reading, Official Receiver, released November 22nd.

Company Liquidations

Grippall Electrical Products, Ltd.—Meeting December 31st at Bassishaw House, Basinghall Street, E.C., to receive an account of the winding-up by the liquidator, Mr. C. Wallis.

R. Brightwell, Ltd.—Meeting January 2nd at Balfour House, Finsbury Pavement, E.C., to receive an account of the winding-up by the liquidator, Mr. W. A. J. Osborne.

Dissolutions of Partnership

"Comet" Radio Service, radio and electrical engineers, 5A, Eastgate Street, Stafford.—Messrs. B. W. Finney and R. L. Greaves have dissolved partnership. Mr. Finney will attend to debts and carry on the business.

Price Jones & Newing, electrical engineers and contractors, 510A, High Road, Tottenham.—Messrs. H. C. Jones, E. A. Price and S. J. Newing have dissolved partnership. Messrs. E. A. Price and S. J. Newing will attend to debts.

Price & Newing, electrical engineers and contractors, 510A, High Road, Tottenham.—Messrs. E. A. Price and S. J. Newing have dissolved partnership. Mr. Newing will attend to debts.

Electricity Supply

Lighting, Domestic, Power

Aberdeenshire.—DISTRIBUTION SCHEMES.—At a meeting of the County Road Board last week approval was given to the Grampian Electricity Supply Company's plans for providing a distribution network, partly overhead and partly underground, in Inverurie; erecting overhead lines from Kintore to Inverurie and from Strichen to Ellon; and carrying out extensions at Huntly.

Angus.—COMMITTEE TO CONSIDER RURAL SUPPLIES.—At a recent meeting of the County Council Finance Committee the question of rural electricity supplies being provided at a reasonable cost was discussed, and a sub-committee was appointed to investigate the matter.

Ashton-under-Lyne.—CHRISTMAS ILLUMINATIONS.—Electrical illumination of public and other buildings will be a feature of the Christmas Shopping Festival organised by the Ashton Chamber of Trade. There will be two archways of coloured lamps in St. Michael's and Henry Squares, and the public baths, library and market are to be outlined with these lamps. An illuminated bus will tour the district. A special tariff of 1d. per kWh (as against the usual 3d.) is offered by the Electricity Department for illumination purposes.

Australia.—AN ELECTRICITY COMMISSION FOR QUEENSLAND.—Mr. Forgan Smith, the Queensland Premier, recently announced that the State Government is considering the establishment of an Electricity Commission to rationalise and control the electricity supply of the State. He said he understood that the New South Wales Government contemplated similar action.

GEELONG SUPPLY.—A high-voltage transmission line is being erected between Melbourne and Geelong in order to bring the latter district within the power supply system of the State Electricity Commission. In five years the demand for electricity in Geelong has increased from twelve million to seventeen million kWh.

Bedford.—MAINS AND SERVICES.—The Electricity Committee has obtained sanction to borrow £40,000 for mains and services.

Birkenhead.—LOAN.—The Electricity Committee has obtained sanction to borrow £35,000, of which £30,000 is for mains.

Blaydon-on-Tyne.—UNDERGROUND CABLES.—Plans have been approved by the Urban District Council for the North-Eastern Electric Supply Co., Ltd., to lay underground low-voltage cables at Blaydon Bank, Holly Avenue, Winlaton, and to the new housing estate at Winlaton.

Bridge-Blean.—EXTENSIONS OF SUPPLY.—The Kent Electric Power Co., Ltd., has informed the Rural District Council that it is taking steps to extend its supply of electricity to Bishopsbourne, Kingston, Out-Elmstead, Barham and Adisham.

Canada.—A LARGE HYDRO-ELECTRIC SCHEME.—Proposals to make Ontario self-sufficient, for several years at least, in the matter of power supply will soon be placed before the newly elected Canadian Government at Ottawa, states the *Financial Times*. The plan is to divert the Ogoki River, connecting the Albany River with Lake Nipigon, and thereby to provide an additional 392,000 h.p. of electrical energy. The estimated initial cost is $3,000,000, and among the anticipated benefits would be an estimated additional revenue of $1,200,000 annually, together with a rise in the level of the Great Lakes system. The co-operation of the Federal Government in carrying out the scheme will be invited under the terms of the Canada-Ontario St. Lawrence agreement, which provided that the Government would pay 50 per cent. of the cost of the Ogoki diversion.

Darlington.—DISCOUNT FOR CONSUMERS.—The Town Council has decided to allow electricity consumers a special discount of 20 per cent. in respect of the current quarter.

Denmark.—NEW POWER STATION.—A large power plant will be erected at Kyndby, Zealand, by N.E.S.A. An extensive site has been bought at the Roskilde fjord, where a special harbour will be built in connection with the new works. The station will provide the greater part of Zealand with power, states our Copenhagen correspondent.

Derby.—A MAYORAL LEAD.—During the course of an inspection of the Electricity Department's new demonstration hall by members of the Council and their wives last week, the Mayor (Alderman J. Clark) remarked that his own house was all-electric. He said that housewives were finding that electricity lessened their toil considerably. Details of the work which is being done in Derby in making electricity available to the working classes were given by Alderman Sturgess, who said that there were now 12,000 assisted wiring consumers in the town, and that these were being persuaded to take domestic supplies.

Eastbourne.—SUPPLY TO AN ESTATE.—At a cost of £3,265 the Electricity Committee is to provide a supply to the Hydneye estate, where 247 houses are to be built. In addition, sanction is being sought to a loan of £25,000 for extensions.

Eastry (Kent).—NEW RURAL SUPPLIES.—The South-East Kent Electric Power Co., Ltd., has informed the Rural District Council that it is making every effort to establish electricity supplies at Ashley, Studdale and Woodnesborough before Christmas, and at Sarre, Monkton and Way early in the New Year. Arrangements have been made to tap the main transmission line from Wingham to Ash near Staple Railway Halt in order to afford a supply to that district, but owing to the heavy programme of work which the company is undertaking it is unable to state definitely when this will be done.

Galgate (Lancs).—PUBLIC LIGHTING.—A scheme for public lighting at Galgate is being prepared by the Lancaster Electricity Committee.

Guernsey.—MODERN LIGHTING IN AN OLD CHURCH.—The Eglise de St. Michel, which is supposed to have been built in the ninth or tenth century, has recently been wired by the States of Guernsey Electricity Department. The Henley "Nomet" wiring system was used, particularly on account of dampness. The junction boxes were specially treated with plastic compound, and the fixing clips and Rawlplugs were treated with shellac.

The ancient church of St. Michel, Guernsey, lighted by electricity

Guildford.—EXTENSION.—The Electricity Committee is to extend mains at Peaslake at a cost of £900.

Haslingden.—A CHRISTMAS LIGHTING TARIFF.—The Corporation is considering a proposal that during Christmas week shopkeepers should be charged 3d. per kWh for all electricity required above ordinary consumption, provided their shop windows are illuminated until 10.30 p.m. each evening.

Hawkinge.—ELECTRICITY EXTENSIONS.—The Folkestone Electricity Supply Co., Ltd., is taking steps to give a supply of electricity to Hawkinge, where street lighting is to be introduced, and thence to Stalling Minnis.

Heckmondwike.—CHANGE-OVER.—The Urban District Council has received sanction to a loan of £42,179 for carrying out the change-over.

Kent.—HOSPITAL INSTALLATION.—The County Council is to install electricity at a cost of £1,000 in the parts of the county hospital at Chatham now lighted by gas.

Lancaster.—SAFES INSTEAD OF METERS.—The Electricity Committee has decided to lend home safes to consumers instead of installing prepayment meters.

Llandrindod Wells.—LOAN.—The Urban District Council has applied for a loan of £1,000 for electricity purposes.

Lochgilphead.—STREET LIGHTING.—An estimate has been submitted to the Town Council from the Campbeltown and Mid-Argyll Electricity Supply Co., Ltd., for the provision of street lighting.

London.—POPLAR.—The Electricity Committee is to provide a sub-station at a cost of £1,400, sub-station equipment at £1,046, and mains at £2,153 in conection with the supply to Messrs. Kemball, Bishop & Co., Ltd., Imperial Street, Bromley. It has also approved a revised scheme for extensions to mains and sub-stations costing £12,553. A supply is to be provided to Messrs. Joseph Ebner, Ltd., at Stewart Street, Cubitt Town, at a cost of £3,828.

Manchester.—SUB-STATIONS.—The Electricity Committee is seeking sanction to borrow £45,000 for sub-station buildings and plant.

Mansfield.—SUPPLY TO AN ESTATE.—The Electricity Committee is to provide an electricity supply to the Intake estate at a cost of £1,750.

Markinch (Fifeshire).—Steps are being taken to introduce electricity for house and street lighting purposes at Kirkforthar Feus, near Markinch.

Motherwell.—DOMESTIC DISCOUNT.—The Electricity Department is offering its domestic customers a discount of 5 per cent., provided the accounts are paid within ten days.

New Zealand.—WELLINGTON.—Mr. M. Cable, the general manager of the Electricity Department, reports a total revenue

of £313,921 in 1934-35, an increase of £6,333 over the previous year, while working expenses rose from £171,664 to £183,210. There was a net credit balance of £14,276 (£13,434). Altogether 56,304,000 kWh was supplied to 36,675 consumers.

Newark.—CHRISTMAS FLOODLIGHTING.—During Christmas week the castle and parish church are to be floodlighted.

SUB-STATION EXTENSIONS.—The Electricity Committee is carrying out sub-station extensions at a cost of £2,245.

Oldham.—MORE SODIUM LAMPS?—Following a report by Mr. C. Worswick, lighting superintendent, that the sodium electric-discharge lamps have given entire satisfaction, the question of extending the installation is being considered.

Portland.—NEW EQUIPMENT.—The Electricity Committee has obtained sanction to borrow £2,000 for mains and services, £1,200 for meters and £2,500 for consumers' electrical apparatus.

Port Talbot.—GRID SUPPLY.—The Council has accepted the terms of the Central Electricity Board for a 11-kV supply.

Russia.—SUPPLY PROGRESS IN THE LENINGRAD DISTRICT.—The remarkable growth of electricity requirements in and around Leningrad is described in an article by J. Antinkhin in *Electrochestvo*. In 1933 the Dubrovka plant was augmented by a large turbine and steam raising plant made in Leningrad and Moscow, while the Svir scheme has progressed by the addition of a 24,000 kW generating set installed in December, 1933, and two similar sets provided last year. The Lenergo system has had the capacity of its plant increased from 273,000 kW in 1930 to 516,000 kW in 1934, and the production of electrical energy has risen in the same period from 950 million kWh to 2,059 million kWh. To complete the 1936 supply programme in Leningrad a further 100,000 kW of plant will be required. One of the chief difficulties encountered during the past four years has been the inadequacy of the distribution system, at least 100 km of lines being required to meet present needs. The networks have been badly overloaded, and much damage has been done to sub-station plant. Lack of suitable oil circuit-breakers and the absence of satisfactory protective systems are other problems which have had to be faced. The increased production of electrical plant in Russia has resulted in a shortage of non-ferrous metals, and at the present time the supply of copper and aluminium is insufficient to meet the demand for underground and overhead network equipment.

Shipley.—RATE FOR SPECIAL LIGHTING.—A charge of 2½d. per kWh has been fixed for sign and floodlighting.

Stafford.—RURAL WATER SUPPLIES.—The consulting engineer recommends the use of electrically operated pumping plant in connection with a £62,000 water supply scheme which is being considered by the Rural District Council.

Stoke-on-Trent.—NEW FEEDER.—The Electricity Committee is to lay a feeder from Hanley to Burslem, with an interconnecting sub-station at Etruria, at a cost of £18,000, and erect a sub-station in High Street, Burslem, at a cost of £1,012.

CHANGE-OVERS.—The supply at the Coronation Pottery is to be changed over at a cost of £440, as is also that at the premises of Messrs. J. H. Barratt & Co., Ltd., in Boothen Road (£1,500).

WATER HEATING TARIFF.—Electricity for thermal-storage water heating is to be supplied by the Electricity Committee at ½d. per kWh between 8 p.m. and 8 a.m., consumers to provide the necessary time switches.

EXTENSIONS.—The Electricity Committee has obtained sanction to borrow £123,000 for extensions.

Swadlincote.—ELECTRICITY REFUSED.—Tenants of Swadlincote Council houses recently presented a petition requesting permission to have their houses wired for electricity, but the Council rejected the application. The U.D.C. owns the gasworks in the area, electricity being supplied by Burton-on-Trent Corporation.

Uxbridge.—SUB-STATION.—The Uxbridge and District Electricity Supply Co., Ltd., is to erect a sub-station in Cowley Road.

Wembley.—ARBITRATOR'S AWARD.—The Urban District Council has been informed of the official arbitrator's award in the claim for compensation against the Central Electricity Board in consequence of the erection of towers and overhead wires on the Council's land. It is understood that the Council, which claimed £1,500 compensation, has been awarded £300, the Board to pay the costs of both sides. The amount is £100 more than was suggested by the Board's legal representative when stating a case before the arbitrator. The decision brings to an end negotiations which have been proceeding for several years, the towers and wires having been erected in 1931.

Whitworth.—CHEAPER PUBLIC LIGHTING.—As from January 1st next the Electricity Committee is reducing the public lighting tariff by ½d. per kWh.

Windlesham (Surrey).—PROPOSED SUPPLY.—The Ascot Gas & Electricity Co. is taking steps to extend its electricity supply to Windlesham by overhead lines, but at present the scheme is held up because two landowners object to poles being erected on their property.

Wirksworth (Derbyshire).—THE GRID AND ELECTRICITY TARIFFS.—The Urban District Council recently approached the Derbyshire & Notts Electric Power Co. with a view to securing a reduction of charges, and Mr. R. I. King, a representative of the company, attended a meeting of the Council last week to explain the position. He said that there was no justification for a reduction as coal, wages and rates were all costing more. The reason electricity was singled out for these campaigns to secure reduced prices was probably to be found in the grid system, which most people thought was going to cheapen the cost of energy. So far it had done nothing of the sort in Derbyshire or Notts. The company's generating station at Spondon had been made a selected station, which meant that they were bound to generate a surplus of electricity over and above their requirements for export to the Central Electricity Board, which paid them only the equivalent of the cost of the coal required to produce it. The grid would benefit some of those rural areas which had been served previously by uneconomic generating plant, but that was not the position in Derbyshire and Notts. The cost of generating electricity was no criterion; it was the cost of distribution and overhead charges that mattered.

York.—LOANS.—Sanction has been received to the City Council borrowing £12,000 for purchasing electricity consumers' apparatus, and application is being made for permission to negotiate further loans of £35,000 for unspecified mains and £6,000 for assisted wiring.

Municipal Supply Undertakings' Results

Town.	Engineer.	Total Revenue.		Working Expenses.		Net Profit.		Sales of Electricity.		
								Thousands of kWh.		Percentage Increase.
		1933/34.	1934/35.	1933/34.	1934/35.	1933/34.	1934/35.	1933/34.	1934/35.	
		£	£	£	£	£	£			
Aberdeen	J. A. Bell	242,229	244,077	106,401	113,553	26,514	30,335	43,862	46,993	7.1
Aylesbury	W. A. Turnbull	37,601	49,555	80,369	87,985	16,196	8,508	11,453	13,439	17.3
Bedford	R. W. L. Phillips	168,193	170,460	125,805	135,117	−5,049	−16,638	*48,661	40,906	−15.9
Bexhill	C. A. Frost	50,056	54,073	35,139	35,597	3,305	6,562	6,135	6,610	7.7
Bexley	A. J. Abraham	74,418	87,682	38,803	51,334	18,581	15,629	9,481	11,567	22.0
Birkenhead	F. E. Spencer	282,832	276,998	150,699	180,854	29,895	5,263	41,240	45,956	11.4
Bradford	T. Roles	647,767	660,103	483,287	490,580	21,885	24,556	117,964	125,617	6.5
Bridlington	A. J. Beckett	32,906	36,101	17,408	19,140	4,578	5,890	2,331	2,737	17.4
Bristol	A. J. Newman	770,552	833,622	336,932	400,867	68,691	37,569	144,415	175,865	21.7
Cannock	P. Wardle	46,020	52,422	28,089	34,326	3,660	2,913	6,214	7,582	22.0
Cardiff	E. Jones	302,153	324,272	142,018	159,539	41,142	22,312	57,117	70,394	23.2
Chester	S. E. Britton	125,447	136,984	76,056	83,440	2,650	5,357	16,406	18,730	14.1
Darwen	F. M. Fletcher	37,578	38,438	22,326	24,930	5,611	3,121	5,839	5,928	1.5
Derby	F. Nicholls	275,434	288,460	114,168	173,412	44,467	35,695	48,390	55,450	14.6
Douglas	B. Kelly	49,334	58,250	24,525	29,750	1,794	5,271	3,010	4,292	42.6
Eastbourne	J. K. Brydges	216,760	221,828	145,029	149,375	11,568	9,873	28,640	30,081	5.0
Eccles	H. W. Angus	56,387	62,553	37,939	43,091	6,941	6,680	9,589	11,107	15.8
Gillingham	H. Hall	83,693	86,033	57,687	67,290	11,414	18,135	16,213	17,527	8.1
Halifax	G. A. Vowles	203,791	209,068	136,782	146,895	21,522	19,016	41,185	44,512	8.1
Hastings	A. J. Ryan	185,619	195,771	122,472	121,165	7,140	16,913	30,710	33,943	10.5
Islington	A. P. MacAlister	371,503	373,268	265,447	252,963	54,525	65,597	42,922	45,744	6.6
Kirkcaldy	O. F. Francis	41,485	40,720	23,806	25,004	532	−84	6,916	7,634	10.3
Morecambe and Heysham	P. Clegg	56,450	66,628	25,528	31,214	7,994	9,254	5,998	8,186	36.4
Mountain Ash	E. W. Jones	21,339	22,151	17,009	18 413	3,521	3,219	1,837	2,039	11.0
Nelson	T. Dawson Martin	81,856	88,641	58,778	58,377	816	7,803	14,217	15,086	6.1
Newark	R. E. Livesley	23,074	27,257	15,739	19,840	3,050	3,042	4,465	5,666	26.9
Newton-in-Makerfield	W. Phoenix	24,407	26,021	17,568	19,641	2,125	1,243	4,564	4,927	7.9
Norwich	V. A. Pask	373,020	386,227	229,565	255,165	42,637	39,999	51,248	55,983	9.2
Preston	D. Adams	392,581	411,339	194,826	277,743	15,640	6,174	122,389	135,250	10.5
Southampton	W. G. Turner	332,982	328,169	152,214	184,623	41,813	6,585	57,360	67,491	17.7
South Shields	J. Edgar	116,079	118,965	60,435	67,097	527	−3,383	12,038	12,538	5.0
Stirling	W. R. Murray	22,027	23,263	16,878	17,564	877	596	2,825	3,295	16.2
Stretford	T. A. Kerr	310,835	359,636	191,689	231,840	17,073	32,407	93,722	123,951	32.3
Wallasey	B. T. Hawkins	202,017	225,106	111,363	139,362	32,391	29,076	†46,777	25,158	−46.2
Walton and Weybridge	E. A. Anderson	40,433	42,469	25,756	30,333	2,868	473	4,187	5,495	31.2
Watford	A. W. Barham	168,081	180,890	86,607	101,591	23,167	21,358	40,542	44,630	10.1
Wimbledon	A. E. McKenzie	244,007	285,665	192,165	211,942	51,842	53,723	43,609	47,357	8.6
Winchester	R. Ayton	43,038	44,657	24,506	25,772	973	1,529	3,339	5,434	2.8

* Including 14,899,000 kWh bulk supply to Bedfordshire, Cambridgeshire and Huntingdonshire Electricity Co. now taken over by C.E.B.
† Including 23,101,000 kWh bulk supply to Birkenhead now taken over by C.E.B.

Traction

Africa.—DIESEL-ELECTRIC LOCOMOTIVES.—Three supercharged 83-ton diesel-electric locomotives of 950 b.h.p. have been sent to the Congo-Ocean Railway, a new line near the mouth of the Congo. The electrical control is on the Jeumont system, and the 600 kW main generator feeds six traction motors of 90 kW each.

Blackpool.—WHERE TRAMS ARE NOT OUT-OF-DATE.—Pursuing its policy of modernising the tramways, the Transport Department during 1934-35 built a new depôt capable of accommodating 140 cars; relaid considerable sections of track and replaced overhead line standards; installed additional substation plant; and put into service a fleet of new rail coaches and tramcars of attractive designs. That this policy has been justified is shown by the working results set out in the annual report of the general manager, Mr. W. Luff. These show that during the two years of reorganisation the gross profit of the department has risen from £103,516 to £145,723, the total income in the past year (including that from omnibuses and the central repairs depôt) being £470,114. The tramways carried 49.1 million passengers (48.8 and 41.4 millions in the two previous years), while the omnibuses transported 14.3 millions (compared with 11.6 and 9.7 millions). There was an increase of 501,669 in the tram mileage, in addition to which the services were speeded up and acceleration improved, so that power expenses increased by £4,511; altogether 9 million kWh was consumed for traction purposes, as against 7.8 million kWh in 1933-34. On the other hand, maintenance and repairs cost

An 84-seater sliding-roof tramcar in use at Blackpool

£3,829 less, but rates were £3,452 higher, due to an amended assessment, and restoration of the economy cut in the staff wages added £4,000 to the expenditure. Taking into account net profits of £11,326 from the omnibuses and £1,791 from the central repairs depôt, and after meeting loan charges of £68,450, there was a net profit of £52,853, of which £9,000 was allocated to the relief of rates, £11,412 to reserve, £20,000 to the permanent way renewal fund, and £10,259 as a revenue contribution to capital outlay, the remainder being set aside for transport stations and sidings deficiencies.

Denmark.—COPENHAGEN TROLLEY-BUSES.—An agreement has been negotiated between the Copenhagen Corporation Transport Board and the power company N.E.S.A., which runs tramcar and trolley-bus services in the northern suburbs of the metropolis, under which trolley-bus services will be started next spring. Overhead equipment is already being erected, and tenders are invited.

Derby.—TROLLEY-BUSES.—The Corporation has applied for a Provisional Order to enable it to run trolley-buses in Derby, Chaddesden and Shardlow. The Nottinghamshire & Derbyshire Traction Company is also seeking powers to run trolley-buses.

Glasgow.—THE SUBWAY OPENED.—The subway electrification scheme has now been completed, and this week both circles were open to public service.

Italy.—SECONDARY LINES ELECTRIFIED.—In addition to the extensive conversion schemes recently completed by the Italian State Railways, the electrification of the lines of the small private companies in Italy has been proceeding, and there are now 1,150 miles of these railways worked by electric traction, principally on the 600 and 3,000 V d.c. systems, but partly by a.c. The traffic is operated by 135 electric locomotives and 240 motor coaches.

London.—TUBE TRAIN DERAILED.—Trains on the Edgware to Morden line were delayed for about two hours early on Tuesday morning owing to the leading car of one of the trains leaving the rails outside Golders Green station and blocking all southbound lines. No one was hurt and normal services were resumed at 10.35 a.m.

TRANSPORT SCHEME TO GO BEFORE PARLIAMENT.—The London Passenger Transport Board has given notice of its intention to apply in the present Session of Parliament for power to carry out the extensions which have already been announced in the ELECTRICAL REVIEW.

Middlesex.—TRAFFIC SIGNALS.—The Highways Committee is to provide additional traffic signals at a cost of £50,000.

New Zealand.—WELLINGTON.—A revenue of £353,061 in 1934-35, slightly more than in the previous year, is reported by Mr. M. Cable, the general manager of the Corporation Tramways Department. Working expenses rose by £11,753 to £268,995, with the result that the surplus of £1,382 in 1933-34 was turned into a deficiency of £346. The number of passengers carried was 39,204,848, an increase of 3,498,902 over the previous year.

Preston.—TRAMS DISPLACED.—The complete change over from trams to buses will take place on December 16th, the last tram running on Sunday, December 15th.

Reading.—TROLLEY VEHICLES.—The Corporation has applied for a Provisional Order to enable it to run trolley-buses in Reading and Tilehurst.

South Africa.—RAILWAY ELECTRIFICATION.—The possibility of the Rand to Pretoria railway line being electrified when the electrification along the Reef has been completed was foreshadowed by the Minister of Railways in a recent speech at Pretoria.

Wolverhampton.—TROLLEY-BUS PLANS.—The Corporation is seeking powers to run trolley-vehicles on eight routes.

Communications

Australia.—NEW SUBMARINE CABLE.—The telephone cable across Bass Strait, which was manufactured by Messrs. Siemens Brothers & Co., has now been laid by that company's cableship *Faraday*, the work being completed on November 25th. The cable connects the land lines of the Australian mainland with those of Tasmania, thus completing the establishment of telephone communication between all the States of the Commonwealth. The cable is 161 nautical miles in length and provides for the simultaneous operation of at least five telephone circuits, a broadcast programme, and not less than seven high-speed telegraph channels over a single insulated conductor. In order to achieve so many services simultaneously over one conductor the cable will be operated by carrier currents with a frequency range up to 42,500 cycles per second, which is much in advance of anything hitherto attempted with submarine cables. The cable is of the coaxial type and is similar to one laid in 1930 between Key West and Havana, although longer. The cable consists essentially of a central copper conductor surrounded by a dielectric of paragutta. The return conductor comprises six copper tapes which are wound concentrically round the insulation. As a protection against the teredo a copper tape is wound continuously round the core and the whole cable is then armoured in the usual manner with steel wires bedded in jute. Paragutta retains all the good features of gutta-percha, and at the higher frequencies employed for carrier telephone transmission it has considerably lower energy losses.

France.—TELEPHONE CABLE DAMAGED.—One of the principal telephone cables in France was damaged last week and caused considerable delay in the services between England and several foreign countries. On Tuesday the Post Office stated that repairs had been effected and services to the Continent were again normal.

Great Britain.—A LONDON TELECOMMUNICATIONS REGION.—The Departmental Committee which is considering the detailed application of the Bridgeman Committee's recommendations has issued a report which foreshadows the establishment of a regional organisation for London. According to a summary of the report in *The Times*, it is proposed that a London Telecommunications Region should be formed which would extend from St. Albans to Reigate and Redhill, and from Gravesend to Staines. It would be responsible for over 500,000 exchange lines, nearly 250 telephone exchanges—including the London Trunk Exchange—and also the Central Telegraph Office. The control of the telegraph and telephone services would be placed in the hands of a regional director, who would be assisted by one or more deputies and by a number of heads of functional branches. There would be branches responsible for all engineering activities; telephone operating, sales and service; telegraph operating and service; staff and financial matters. The region would be divided into eight areas, each dealing with the day-to-day aspects of the services.

SPECIAL CHRISTMAS TELEPHONE FACILITIES.—During Christmastide the trunk telephone rates will operate as follows:—December 24th: Night rate to apply from 5 p.m. to midnight. December 25th: Night rate up to 5 a.m.; intermediate (or afternoon) rates, 5 a.m. to 9 a.m.; night rate, 9 a.m. to 1 p.m.; full rates, 1 p.m. to midnight. December 26th: The intermediate rates will apply from 7 p.m. to midnight.

Palestine.—TELEPHONING TO BAGHDAD.—The trunk telephone line between Palestine and Iraq was inaugurated on November 27th by Mr. Hall, the chief secretary.

South Africa.—MORE TELEPHONES.—The demand for telephone installations in Johannesburg is rapidly expanding. In October the number of subscribers was 30,108, an increase of 12,827 since March, 1932, and there is a waiting list of between 300 and 400. The increase is attributed to cheaper rates and building activity.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdeen.—December 14th. County Education Committee. Central heating and electric lighting of premises to be used as junior instruction centre. E. L. Williamson, architect, 154, Union Street.

Abertillery.—January 9th. Electricity Department. Plant and equipment for change-over from d.c. to a.c. (See this issue.)

Argentina.—BUENOS AIRES.—December 26th. State Oilfields Directorate. Thirteen transformers and circuit-breakers and switches, &c. (T.Y. 10252.)* Fifty-one induction motors with control gear, switches, &c. (T.Y. 10251.)*

Australia.—MELBOURNE.—January 13th. Electric Supply Committee. 6,600-V and 22,000-V switchgear for the Waratah Place sub-station. (T.Y. 10214/5.)*

January 13th. State Electricity Commission of Victoria. Two compound-filled feeder circuit-breaker units. (T.Y. 10209.)*

January 15th. Victoria Railways Commission. R.i. taped and braided copper conductors. (T.Y. 10212.)*

BRISBANE.—January 17th. City Council. One 500-kW turbo-alternator. (T.Y. 10247.)*

Barking.—December 16th. Essex C.C. Education Committee. Electrical installation at South-East Essex Technical College. (November 29th.)

Beeston and Stapleford.—December 23rd. U.D.C. Electrically operated, vertical spindle centrifugal pumps for new pumping station at Beeston. W. H. Radford & Son, consulting engineers, Albion Chambers, King Street, Nottingham (deposit £5 5s.).

Blackpool.—December 11th. Electricity Department. Transformers. (November 29th.)

Bridgend.—January 3rd. Electricity Committee. Materials and labour in connection with underground and overhead mains extensions. (See this issue.)

Brighton.—December 9th. Electricity Department. Oil immersed three-phase reactor. (November 22nd.)

Cardiff.—December 9th. Electricity Department. Switchgear. (November 29th.)

Cheadle & Gatley.—December 13th. Electricity Department. One 350-kVA transformer with manually operated on-load tap changer. (November 29th.)

Edinburgh.—December 14th. Corporation. Four electric hydro extractors at the public washhouse, South Gray's Close. City architect.

Egypt.—KHARTOUM.—December 29th. Ministry of Public Works. Fifty-six a.c. ceiling-type electric fans with speed regulators. (T.Y. 10238.)*

CAIRO.—January 28th. Ministry of the Interior. Two transformer kiosks, each containing a 70-kVA transformer and 3,150-V and 220-V cable. (T.Y. 10249.)*

Farnworth.—December 12th. Electricity Department. L.p. cables, transformer and l.p. switchgear. (November 29th.)

Fife.—December 10th. County Council. Various works, including electric lighting, at the new drill hall at Foulford school, Cowdenbeath. G. Sandilands, County master of works, Kirkcaldy (deposit £1 1s.).

Gloucester.—Electricity Department. One 200-kVA outdoor transformer. (November 29th.)

Hazel Grove & Bramhall.—December 10th. Electricity Department. One 500-kVA and one 50-kVA transformers. (See this issue.)

Heston and Isleworth.—December 9th. Electricity Department. E.h.p. cables, transformers and switchgear. (November 22nd.)

December 13th. Street-lighting equipment. (November 29th.)

Hornsey.—December 16th. Electricity Department. Meters, demand indicators, time switches and load controllers. (See this issue.)

Hull.—December 13th. City Council. Electrical installation at the junior and senior departments of the Endike Lane West school. D. Harvey, city architect, Guildhall (deposit £1 1s.).

India.—December 20th. Bombay, Baroda and Central India Railway Co. Boxes, plates, separators, &c., for train-lighting accumulators. (See this issue.)

NEW DELHI.—January 2nd. Stores Department. Five overhead electric travelling cranes with spare parts. (T.Y. 5529.)*

Irish Free State.—DUBLIN.—December 31st. Electricity Supply Board. P.i. cables; 40-kV underground power cables and jointing accessories in Dublin. (November 22nd.)

DUN LAOGHAIRE.—December 11th. Vocational Education Committee. Electrical installation at the Municipal Technical Institute. F. F. MacCarthy, chief executive officer, Municipal Technical Institute (deposit £3 3s.).

London.—CENTRAL ELECTRICITY BOARD.—December 9th. 66-kV overhead transmission lines for the North-West England and North Wales Electricity Scheme. (November 1st.)

ISLINGTON.—January 15th. Borough Council. Electrical materials for one year from April 1st, 1936. (See this issue.)

METROPOLITAN WATER BOARD.—January 3rd. Portable electric generator units and centrifugal pumping plant at the Hampton pumping station. Chief engineer, Room 235, 173, Rosebery Avenue, E.C.1 (deposit £2 2s.).

Manchester.—December 9th. Watch Committee. Electric passenger lift at the chief fire station. City architect, Town Hall (deposit £1 1s.).

December 30th. Electricity Committee. Two water-tube boilers. (November 29th.)

New Zealand.—WELLINGTON.—January 14th. Post and Telegraph Department. Twenty-five secondary cells. (T.Y. 10226.)* 24,600 switchboard cords. (T.Y. 10231.)*

January 21st. 3,000 metal-cased condensers. (T.Y. 10234.)*

Northern Ireland.—ARMAGH.—December 12th. County Education Committee. Electric lighting at the new King's Park school, Lurgan. J. St. J. Phillips, architect, 16, Donegall Square South, Belfast (deposit £2 2s.).

Otley.—December 14th. U.D.C. Various works, including electrical, at bungalows on the Well Croft estate. Surveyor, Council Offices.

Plymouth.—December 7th. Corporation. 33,000-V switchgear, 33,000/6,600-V transformers, and auxiliary apparatus. (November 8th.)

Portsmouth.—Electricity Department. One 30,000-kW turbo-alternator and two water-tube boilers. (See this issue.)

Rotherham.—December 7th. One 300-kW rectifier equipment and switchgear for traction duty. T. P. Sykes, transport manager, Municipal Buildings, Howard Street.

Scunthorpe and Frodingham.—December 9th. U.D.C. Pilot cable for North Lindsey water scheme. (November 29th.)

December 23rd. Electrically driven pumping plant for two pumping stations. (See this issue.)

Sheffield.—December 30th. Electricity Department. Four water tube boilers. (November 29th.)

December 14th. Electric lighting installation in three departments at Arbourthorne school and caretaker's house. W. G. Davies, city architect, Town Hall.

Stanley (DURHAM).—December 12th. Electricity Department. Meters, lamps, cables and wiring supplies. (November 22nd.)

West Riding.—December 30th. County Council. L.p. hot-water apparatus and electric lighting for the extensions of Upton Council school. Education officer, County Hall, Wakefield.

Wimbledon.—December 9th. Corporation. 11,000-V and 2,200-V p.i. power cables and pi'ot cable. (November 29th.)

Worthing.—December 14th. Electricity Department. Transformer kiosk sub-station. (See this issue.)

* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Alnwick.—R.D.C. Accepted. Electric motors in connection with pumping machinery at Shilbottle colliery (£151).—Metropolitan-Vickers Electrical Co., Ltd.

Australia.—COMMONWEALTH.—P.M.G.'s Department. Accepted. Valves for broadcasting stations and studios (£408), cord type switchboards (£2,841), telegraph instruments (£539), and cords and instruments (£255).—Standard Telephones & Cables (A'sia.), Ltd. Valves for broadcasting stations and studios (£2,090).—Philips Lamps (A'sia.), Ltd. Cord type switchboards (£23,717) and plugs and sleeves (£505).—Ericsson Telephone Manufacturing Co. Telegraph instruments (£203).—Automatic Telephones (A'sia), Ltd. Switchboard cords (£1,329).—British Insulated Cables, Ltd. Cords and instruments.—Siemens Bros. & Co., Ltd. (£2,455); Liverpool Electric Cable Co., Ltd. (£1,513). Plugs and sleeves (£2,932).—Telephone Manufacturing Co., Ltd.

NEW SOUTH WALES.—NEWCASTLE.—City Council. Accepted. Bare copper cable (£1,080).—Enfield Cable Co.

VICTORIA.—State Electricity Commission. Accepted. Compound filled switchgear and accessories.—A. Reyrolle & Co., Ltd.

MELBOURNE.—City Council. Accepted. Electricity meters (£1,445).—British Insulated Cables, Ltd.

QUEENSLAND.—BRISBANE.—City Council. Accepted. Aerial double-braided cable (£1,075).—Enfield Cable Works, Ltd.—*Tenders.*

Barking.—Electricity Committee. Accepted. Cables for Wykeham Green sub-station (£248).—Telegraph Construction & Maintenance Co., Ltd. Ring-main switchgear (£129).—Ferguson, Pailin, Ltd.

Durham.—County Education Committee. Accepted. Electrical installation in Council schools: Hedworth Lane, Boldon Colliery (£213).—Falconar, Cross & Co., Ltd., Ross Street, Spennymoor (£148).—W. E. Dove & Co., Ltd.

Epsom.—U.D.C. Accepted. Street lighting columns and bracket fittings (£1,178).—British Thomson-Houston Co., Ltd.

Essex.—Public Assistance Committee. Accepted. Electrically driven continuous dryer at Chelmsford Institution laundry (£330).—W. Wardle & Son.

Glasgow.—Baths Committee. Accepted. Electrical work at the Hutchesontown baths (£468).—Johnstone Park & Co.

Housing Committee. Accepted. Electrical installations: 102 houses at Panmure Street (£452).—R. J. McIntyre; ninety-six houses at Denmark Street (£421).—Darroch & Espie.

Public Assistance Committee. Accepted. Automatic telephone board at Lennox Castle Institution (£1,284).—Ericsson Telephones, Ltd. Electrical fittings and furnishings for Crookston Home.—Laings, Ltd.; J. T. Cartwright & Sons; General Electric Co., Ltd.; W. McGeoch & Co., Ltd.

Transport Committee. Accepted. Copper trolley wire (£624).—W. F. Dennis & Co. (representing Felten & Guilleaume, Germany). The lowest British offer was £688.

Grimsby.—Electricity Committee. Recommended. Cables for twelve months (£12,884).—Johnson & Phillips, Ltd.

Tramways Committee. Recommended. Ten trolley-bus chassis (£1,209 each).—Associated Equipment Co., Ltd.

London.—POPLAR.—Contracts Committee. Recommended. Sub-station equipment (£1,016).—Johnson & Phillips, Ltd. Kiosk (£177).—D. T. Edwards & Co.

Manchester.—Transport Committee. Accepted. Cadmium copper trolley wire.—Richard Johnson & Nephew, Ltd. Electric power and lighting installation at Hyde Road depôt.—S. H. Heywood & Co., Ltd.

Middlesbrough.—Town Council. Accepted. Electric lighting and power plant for the scarlet fever block at the West Lane Hospital (£367).—Graham Bros.

Morecambe.—Transport Committee. Accepted. Electrical installation at new transport depôt.—Simpsons, Lancaster.
Harbour Committee. Recommended. Underwater lighting at new baths (£1,500).—Holophane, Ltd.

Shenley.—Middlesex C.C. Recommended. Electric lighting at Mental Colony farm buildings (£143).—Rashleigh Phipps & Co., Ltd.

Welwyn.—R.D.C. Accepted. Electric lighting at Council houses (£604).—H. C. Denbigh.

Forthcoming Events

Institution of Electrical Engineers.—Monday, December 9th. Institution, London. 7 p.m. Informal meeting. Discussion on "Miscellaneous Novel Applications of Electricity." To be opened by Mr. H. Brierley.

Meter and Instrument Section.—Friday, December 6th. Institution, London. 7 p.m. "The Measurement of Large Supplies of Electrical Energy for Costing Purposes." Messrs. W. Carson and A. H. Gray.

North-Eastern Centre.—Monday, December 9th. Armstrong College, Newcastle-upon-Tyne. 7 p.m. "Modern Developments in Railway Signalling." Major L. H. Peter.

Western Centre.—Monday, December 9th. Municipal Offices, Cheltenham. 6 p.m. "The Engineer Administrator." Mr. E. S. Byng.

North Midland Centre.—Tuesday, December 10th. Hotel Metropole, Leeds. 7 p.m. Major L. H. Peter's paper.

Scottish Centre.—Tuesday, December 10th. North British Station Hotel, Edinburgh. 7 p.m. "A Review of Recent Developments in Rural Electrification." Mr. D. Ross.

Hampshire Sub-Centre.—Wednesday, December 11th. Municipal College, Portsmouth. 7.30 p.m. Faraday Lecture. "Electricity in the Life of To-day." Prof. E. W. Marchant.

Transmission Section.—Wednesday, December 11th. Institution, London. 6 p.m. "Loss of Revenue Due to Poor Regulation on Lighting and Heating Loads." Mr. F. S. Naylor. "Voltage Variation at Consumers' Terminals." Messrs. E. B. Wedmore and W. S. Flight.

Dundee Sub-Centre.—Thursday, December 12th. School of Economics, Dundee. 7.30 p.m. "Electrical Development in the U.S.S.R." Mr. A. Monkhouse.

West Wales (Swansea) Sub-Centre.—Thursday, December 12th. Central Hotel, Swansea. 6.30 p.m. "The Stability Characteristics of Alternators and of Large Interconnected Systems." Mr. W. D. Horsley.

Tees-side Sub-Centre.—Friday, December 13th. Linthorpe Assembly Rooms, Middlesbrough. Annual dance.

Association of Mining Electrical Engineers.—Tuesday, December 10th. Junior Institution of Engineers, S.W.1. 6.30 p.m. "Mines Department Buxton Testing Station." Mr. A. Rainford.

Kent Sub-Branch.—Saturday, December 7th. Technical Institute, Dover. 6.30 p.m. "Steam Winding v. Electrical Winding."

South Wales Branch.—Saturday, December 14th. Cardiff. "Ball and Roller Bearings for Mining Machinery." Mr. J. Spiers.

Institution of Civil Engineers.—Tuesday, December 10th. Institution, London. 6 p.m. "Industrial Agricultural and Domestic Heating with Electricity as a By-Product. Mr. S. B. Donkin.

Institution of Engineers-in-Charge.—Wednesday, December 11th. St. Bride Institute, E.C.4. 7.30 p.m. "Central Heating and Hot Water Supply by Gas, Electricity, Coal and Coke." Messrs. R. I. Willsmer, A. Klausner and H. F. Philliston.

Birmingham Electric Club.—Friday, December 13th. Grand Hotel, Birmingham. 7 p.m. Annual general meeting.

Junior Institution of Engineers.—Friday, December 13th. Royal Society of Arts, W.C. 7.30 p.m. Presidential address. "Coal, Power and Smoke." Sir F. E. Smith.

Our Service Department

It would surprise many of our readers to know how large and varied is the service of information provided by the Editors of the ELECTRICAL REVIEW quite apart from the great mass of material that appears in its pages. For many years past we have received a large number of inquiries on almost every conceivable electrical subject from readers at home and overseas who are prospective purchasers of specified products. These it is our practice to answer to the best of our ability through the post or by telephone.

This is a service which we ungrudgingly render to the reader and to the industry as a whole; we perform it as one of the privileged responsibilities devolving upon us as a representative trade journal. When names of makers of products inquired for are not in our possession we publish the particulars briefly in this section, inviting the co-operation of those who may be able and willing to supply the deficiency. Inquiries should be accompanied by a stamped envelope for reply.

We are asked for the names and addresses of the manufacturers of the following:—

TEMPEX D.1 battery for operating a clock.

HYGRADE lamps.

FRAMA electric welding plant.

Notes

The Northampton Polytechnic Institute

Again the Northampton Polytechnic Institute has had a successful year, though the actual number of students in attendance decreased slightly from 3,049 to 2,946. Six higher certificates and eleven ordinary certificates were obtained in electrical enginering, while the passing of the London B.Sc. (Eng.) final examination by 38 students constitutes a record. Reorganisation of the rooms on the ground floor of the main building has resulted in an excellently arranged suite of workshops for instrument making, wiring, and other electrical trades. At the annual prize distribution on November 28th the principal guest was the Rt. Hon. Oliver Stanley, M.C., M.P., who dealt at some length with the economic development of nations since the War, and its effect in making it even more necessary than ever for Great Britain to ensure quality in her products. Mr. S. C. Laws, the principal, after describing the activities of the Institute during the year, paid a tribute to the work done by Mr. A. C. Jolley, of the electrical engineering department, who, after 38 years' service, will be retiring at the end of this session on account of ill-health. The annual conversazione was held on Friday last.

I.E.E. Scottish Dinner

Mr. Frank Hodges (Central Electricity Board) proposed the toast of "The Institution of Electrical Engineers" at the dinner of the Scottish Centre at Glasgow on November 26th. Mr. J. B. Mavor, centre chairman, presided. Mr. Hodges drew attention to what, perhaps, was going to be the most immediate problem, both politically and economically. What would be the answer of the Institution if, at this moment, the Government were to decide that the electrical industry had to bear the whole cost of an increase of wages to the miners of this country, because it was mooted in some quarters that it was the industry that was best able to bear any increase in the price of coal? He thought, however, it was the intention to spread the burden a little bit wider. Supposing the industry was to bear the brunt of the cost, however, the question was whether electrical technique was equal to the task of further improving productive methods so as to meet any increase in the price of coal. Mr. J. M. Kennedy, the President, in reply, said they were all agreed that some increase of wages was bound to come, and if it resulted in an increase in the cost of coal, then not only would they increase the efficiency of their generating stations, so as to make good that handicap, but they would also increase the efficiency of distribution, and that would far and away outstrip whatever small handicap might result from any increase in the price of coal. Mr. Kennedy referred to the proposed visit of the Institution to Scotland next summer, and paid a tribute to Mr. Joseph Taylor, the secretary of the Scottish Centre. Professor F. G. Baily proposed the health of "The Chairman," and Mr. Mavor responded.

North Eastern E.P.E.A. Dinner

The safety value of modern street and road lighting was emphasised by the Lord Mayor of Newcastle (Alderman W. Locke) and Colonel S. E. Monkhouse, of the North-Eastern Electric Supply Co., Ltd., who were guests of the North-Eastern Division of the Electrical Power Engineers' Association at the annual dinner-dance at Newcastle. The Lord Mayor, proposing the toast of the "Electrical Supply Industry," said that at least 10,000 miles of public roads could be properly lighted under modern methods at a cost of £3,500,000. In the last Budget £4,500,000 was taken out of the Road Fund and used for revenue purposes, and that money ought to have been used for road and street lighting. They would do well in Newcastle to consider the introduction of lighting similar to that at Croydon, Lewisham, and many other places around London. Colonel Monkhouse, in replying, said that the majority of road accidents occurred at night and the solution of the problem lay with them and with street lighting authorities. Referring to the industry generally he said that in this country the consumption of electricity per head of the population was 245 kWh, while in Sweden it was 670 kWh. The toast of "The Association" was proposed by the Mayor of Sunderland (Alderman T. Summerbell) and responded to by Mr. Colin Cooper, president, E.P.E.A.

The E.I.B.A. Newcastle Ball

The seventeenth annual dance of the North-Eastern Branch of the Electrical Industries Benevolent Association was held in the Grand Assembly Rooms, Newcastle-on-Tyne, on November 29th and was attended by 350 guests who were received by Mr. H. Paterson, chairman of the branch, and Mrs. Paterson. A resolution of thanks was passed to Mr. R. H. Davidson, who for several years has organised the dances.

Appointments Vacant

Assistant lecturer in electrical engineering at the University of Liverpool.

Engineer in the Department of the Surveyor of County Buildings for Surrey C.C.

Testing engineer for Wolverhampton Electricity Department.

Assistant engineer for the Posts and Telegraphs Department of the Palestine Government (salary £P.500-£P.15-£P.550).

(See our classified advertisements.)

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

Mr. W. J. Allbright, was the guest of honour at the annual autumnal dinner of the South Metropolitan section of "Clesco," held recently at Chiesman's Restaurant, Lewisham, S.E. The occasion was the last time that the three companies, viz., the South Metropolitan, West Kent and Chislehurst companies, would meet together as one group, and among those present were Mr. C. J. Deave, the local manager and secretary, who presided; Mr. W. J. H. Wood, engineer-in-chief to the County of London Co.; Mr. A. E. Hammersley, engineer and local manager of the West Kent Co.; Mr. A. R. Bacon, chairman of "Clesco," and Mr. A. A. Allsop. Mr. Allbright has recently retired from the position of local manager of the South Metropolitan Co., although he still remains local manager of the South London Electric Supply Corpn., Ltd., and the occasion was chosen for the presentation to him by the staff and employés of a water colour by S. J. Lamorna Birch, R.A., and a silver salver, both suitably inscribed. The presentation was made by Mr. Wood, and Mr. Allbright, in expressing his thanks, spoke of the friendly relations existing with the men, and the loyal support given him throughout the difficulties of the early days.

Mr. J. Orr, B.Sc., Ph.D., lecturer in the Engineering Department of the University of Glasgow, has been recommended by the Glasgow Corporation Education Committee for the appointment of principal teacher in electric welding at the Stow College School of Engineering.

Mr. R. A. Jones has resigned from the staff of Messrs. Francis Polden & Co., Ltd., and in partnership with **Mr. W. T. Jennings,** A.M.I.E.E., is trading as Jones & Jennings, electrical engineers and contractors, 4, Great Queen Street, Kingsway, W.1 (telephone: Holborn 3550).

Manchester Corporation Electricity Committee has expressed appreciation of the services of **Mr. T. Owen,** senior mains foreman, who is retiring after forty years' service.

Mr. J. H. Gold, who was appointed a director and chairman of Messrs. Blackstone & Co. in 1933 upon the reconstruction of the board, has now retired from these positions upon the discharge of the debenture issued to the company's bankers and the acquisition by other interests of the whole of the capital of the company.

Mr. T. Illingworth has been appointed heating engineer by the Hull Corporation Electricity Committee.

Mr. W. S. Gearing has resigned his position as assistant to Mr. C. Reid, of Australia House, Strand, W.C., who for over twelve years has represented Messrs. Whipp & Bourne, Ltd., and the Watford Electric & Manufacturing Co., Ltd.

Lt.-Col. R. Tristram Harper has joined the board of the City of Buenos Ayres Tramways Co. (1904), Ltd.

On November 25th a large company of the staff of the Sun Electrical Co., Ltd., gathered at the Restaurant Frascati to do honour to **Mr. W. J. Rogers** on the occasion of his retirement from the position of secretary to the company, a position which he had held since 1902. The toast of "Our Guest" was proposed by Mr. A. G. Beaver, managing director, who, in the course of his remarks, recalled some of the very early days of the company with which Mr. Rogers was so closely connected. He was supported by Mr. R. Tweedy-Smith, chairman, who, on behalf of the whole company, wished Mr. Rogers a long and happy retirement. Mr. Tweedy-Smith then presented Mr. Rogers with an engraved gold watch and Mrs. Rogers with a gold wristlet watch, both gifts from the directors. The staff as a whole had already presented Mr. Rogers with a combined china cabinet and bookcase in polished walnut.

Mr. W. J. Rogers

Mr. E. A. Logan, resident engineer to the Mid-Cumberland Electricity Co., Ltd., will shortly leave Cockermouth to take up the appointment of deputy electrical engineer to the Erith Urban District Council. Mr. Logan, who is a native of Newcastle, studied under Professor W. M. Thornton, and his first appointment was with the Admiralty Research staff at the Royal Naval Barracks, Portsmouth. He was afterwards assistant engineer with Messrs. Merz & McLelland, consulting engineers, Newcastle.

Capt. Euan Wallace has been appointed Secretary to the Department of Overseas Trade.

Mr. M. K. Tantawi, joint author with **Mr. J. B. Harris** of the article on "Lightning Discharges" (page 774), received his technical education at the Royal Engineering Schools, Giza, and Northampton Engineering College, taking the B.Sc. degree in engineering with honours. His practical training was gained with the British Thomson-Houston Co., Ltd., and in 1930 he was appointed by the Egyptian Government as a teacher in electrical engineering at the Royal Engineering College, Cairo. He is an Associate of the American I.E.E.

Messrs. M. K. Tantawi and J. B. Harris

Mr. Harris was also a student of the Northampton Engineering College, gaining works experience with Lancashire Dynamo & Crypto, Ltd., and the London Power Co. He is at present on the staff of Messrs. Waldo Maitland & Partners, lighting consultants.

Mr. A. Frigon, principal of the Polytechnic School, Montreal, has been appointed chairman of the Electricity Commission of the province of Quebec set up under a recent Act. The other Commissioners are Mr. O. Lefebvre, chief engineer of the Streams Commission, and Mr. J. W. McCammon, a civil engineer.

Major C. E. Prince, O.B.E., M.I.E.E., has resigned from the board of Radiovisor Parent, Ltd., of which he was technical managing director.

Mr. C. W. Hughes, B.Sc., A.M.I.E.E., testing engineer of the Wolverhampton Corporation Electricity Department, has been appointed to the post of assistant area engineer by the London and Home Counties Joint Electricity Authority.

Mr. Charles Furness, borough electrical engineer at Blackpool, is retiring on superannuation on March 31st next after thirty-four years' service with the Corporation.

At the annual dinner of the Western Centre of the Institution of Electrical Engineers, to be held in Cardiff on January 13th, the opportunity will be taken to make a presentation to **Mr. C. G. Morley New** (a past chairman), who left the centre on his appointment as an Electricity Commissioner.

Ald. H. K. Beale, of Birmingham, was re-appointed chairman of the South-West Midlands Advisory Joint Committee at a meeting of the Committee held on November 29th. Ald. Beale has held this appointment since the inception of the Committee in June, 1923.

Obituary

Mr. F. J. Kitson.—We have to record the death on November 19th at Leeds of Mr. Frederick James Kitson, aged seventy-four, joint deputy-chairman of the Yorkshire Electric Power Co.

Dr. C. Sulzberger.—While inspecting the new hydro-electric station at Dixence, of Dr. Carl Sulzberger, of Zurich, Switzerland, vice-president of the Swiss Electro-technical Association, passed away suddenly. The deceased, who was seventy-one years of age, was at one time connected with the Brown-Boveri Co., and was for some years with the A.E.G., Berlin.

Mr. Martin F. Sheedy, whose death is announced, had been engineer in the Power Department of the North-Eastern Electric Supply Co., Ltd., for many years, and had carried out business negotiations in connection with contracts for the supply of electric power at works and factories. He joined the company as a junior engineer in the Operation Department in 1902, after having served his apprenticeship with Messrs. J. Smith & Co., of Leeds.

Professor Norman Bartlett Hill, of the Technical School of Engineering, Cape Town, was drowned at Plymouth on November 29th when the car which he was driving ran over the quay at the Barbican. Professor Hill, who was forty years of age, was on holiday in this country and was to return to South Africa shortly. He was an associate member of the Institution of Electrical Engineers.

Mr. J. A. Crabtree.—We deeply regret to record the death, which occurred on December 3rd at his residence, End Wood, Little Aston Park, Sutton Coldfield, of Mr. John Ashworth Crabtree, chairman and managing director of J. A. Crabtree & Co., Ltd., of Walsall. He was engaged upon the affairs of the business until towards the end of last week, and he passed away on Tuesday, after only a short illness, at the age of forty-nine years. We hope to refer to his career in our next issue.

The late Mr. J. A. Crabtree

Mr. J. W. Barnard, who recently died at his residence at Shepperton, at the age of eighty-seven years, was formerly well known in the electrical world. He was at one time secretary to the Electrical Power Storage Co., and later became the secretary of the long-since-defunct New Telephone Co., originally formed to exploit Dr. Silvanus P. Thompson's telephone. The New Telephone Co. made an attempt to break down private telephone monopoly, but it succumbed to an action brought by the United Telephone Co. for alleged infringement. Later, Mr. Barnard was actively concerned with small electrical storage batteries, and even now the name that he gave to a certain type of battery survives.

Dr. J. D. Cormack.—The death occurred on November 30th at Glasgow, at the age of sixty-five, of Dr. John Dewar Cormack, D.Sc., Regius Professor of Civil Engineering and Mechanics in Glasgow. Dr. Cormack received his education at Dumbarton Academy and at Glasgow University, and in 1892 was appointed lecturer in electrical technology at the Yorkshire College, Leeds. Four years later he was appointed university assistant in engineering and lecturer in electrical engineering at Glasgow University. He was secretary of the International Engineering Congress, which was held in Glasgow in 1901, and in the same year became professor of Mechanical Engineering at University College, London, returning to Glasgow in 1913 to take up the position which he held at the time of his death. He was engaged in important work during the war, and was made C.M.G. in 1917 and received the C.B.E. in 1919. He was a member of the Institutions of Civil, Electrical and Mechanical Engineers, and was the author of numerous scientific and literary papers.

[*Elliott & Fry*

The late Dr. J. D. Cormack

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Copper Cells, Ltd.—Private company. Registered November 27th. Capital, £3,000 in 2,950 ordinary shares of £1 and 1,000 deferred shares of 1s. Objects: To acquire from A. N. Hazlehurst the benefit of a certain existing invention relating to the production, treatment, storage, application, distribution and use of electricity and any apparatus therefor, and to carry on the business of manufacturers of or dealers in and repairers of electrical cells, &c. The directors are: C. D. Cross, 2, Club Buildings, Datchet, and R. E. Taylor, "Athelney," Albemarle Road, Backenham, Kent. Registered office: Royal Stag Yard, Datchet, Bucks.

E. Lohden, Ltd.—Private company. Registered November 27th. Capital, £1,200 in £1 shares. Objects: To acquire the business of an electrical and radio engineer now carried on by E. R. Lohden, at 4, Cinema Parade, Farnham Road, and at 12, Northampton Avenue, Slough, Bucks. The permanent directors are: E. R. Lohden (governing director) and Margaret E. Lohden, 12, Northampton Avenue, Slough, Bucks, and C. F. Slater, 41, Belgrave Road, Slough. Registered office: 4, Cinema Parade, Farnham Road, Slough.

Clydesdale Television & Radio Co., Ltd.—Private company. Registered in Edinburgh November 27th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of and wholesale, retail and credit dealers in television apparatus of all types, &c. The subscribers are: H. T. Eagle, Steamine, Reffeypark, Oldhall, Renfrewshire, and E. R. Mitchell, Cruach, Bearsden, Dumbartonshire. Secretary: J. P. Glen. Registered office: 2, Bridge Street, Glasgow.

Tubular Lighting, Ltd.—Private company. Registered in Edinburgh November 25th. Capital, £3,000 in £1 shares. Objects: To carry on the business of mechanical engineers and manufacturers of and dealers in decorative and display fittings for tubular lighting, &c. The directors are: H. E. de Weerdt, Thorn Cottage, Bearsden, Dumbartonshire, and W. L. Duncan, 72, Waverley Street, Glasgow, S.1. Registered office: 103, Bath Street, Glasgow, C.2.

Brydges (Putney), Ltd.—Private company. Registered November 29th. Capital, £100 in £1 shares. Objects: To carry on the business of electrical engineers, electric lighting and radio specialists, &c. The subscribers are: R. Brydges, 106, Bishops Mansions, Fulham, S.W.6; and F. C. Dowles, 52, Oxford Street, W.1. The first directors are R. Brydges and B. Brydges. Solicitors: Kenneth Elliott & Co., 52, Oxford Street, London, W.1.

Therapeutic Appliances, Ltd.—Private company. Registered November 4th. Capital, £100 in £5s. shares. Objects: To carry on the business of inventors, designers and manufacturers of, agents for and dealers in electrical acoustic apparatus, appliances and accessories (with particular reference to deafness), &c. The directors are: M. J. B. Davy, 51, Addison Avenue, W.11; and N. W. King, Talgarth, East Horsley, Surrey. Secretary: R. A. E. Harris. Registered office: 45, Duke Street, W.1.

Radio-Coustic Laboratories, Ltd.—Private company. Registered November 4th. Capital, £300 in 200 ordinary shares of £1 each and 2,000 founders' shares of 1s. each. Objects: To carry on the business of electrical, radio and acoustic engineers, &c. The permanent directors are: G. W. Adams, "Woodlands," Green Street Hill, Shenley, Herts; and M. G. McBride, 27 "L," Bramham Gardens, Kensington, S.W.5. Registered office: Abbey Mills, Waltham Abbey.

Returns of Electrical Companies

E. P. Cottier, Ltd.—Capital, £1,000 in £1 shares. Returns dated June 28th, 1935. 650 shares taken up. £650 paid. Mortgages and charges, nil. A further 10 shares were allotted, payable in cash and fully called up on July 26th, 1935.

S. Marks & Son, Ltd.—W. F. Baker, of 3/5, Burlington Gardens, London, W.1, ceased to act as receiver and/or manager on November 4th, 1935.

Readylock, Ltd.—Particulars filed of Registered Notes not exceeding £10,500, authorised by resolutions of October 25th, and November 14th, 1935, charged on the company's undertaking and property, including uncalled capital, the amount of the present issue being £2,350.

J. & N. Wade (Portsmouth), Ltd.—Debenture, dated November 6th, 1935, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Branch Nominees, Ltd.

Midget Lamp Company (1924), Ltd.—The nominal capital has been increased by the addition of £23,000 in £1 ordinary shares beyond the registered capital of £2,000.

Pioneer Private Telephone Co., Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated November 4th, 1935, to secure all moneys due or to become due from the company to the Union Bank of Manchester, Ltd.

Peacehaven Electric Light & Power Co., Ltd.—Issue on November 8th, 1935, of £700 debentures, part of a series already registered.

S. P. Catterson & Sons, Ltd.—Satisfaction to the extent of £6,000 on October 17th, 1935, of series of "B" debentures authorised December 8th, 1893, and registered April 5th, 1935.

British Thomson-Houston Co., Ltd.—Satisfaction (a) to the extent of £68,805 on October 31st, 1935, of trust deed dated March 10th, 1902, and registered March 12th, 1902, securing £200,000 debenture stock, and (b) to the extent of £67,200 on same date of trust deed dated November 30th, 1921, and registered December 17th, 1921, securing £3,000,000 debenture stock.

Radioco, Ltd.—Capital, £2,500 in £1 shares. Return dated June 22nd, 1935. 2,200 shares taken up. £2,200 paid. Mortgages and charges, nil.

L. Weekes (Luton), Ltd.—Capital, £6,000 in £1 shares. Return dated June 15th, 1935. All shares taken up. £6,000 considered as paid. Mortgages and charges: £3,000.

Kalgoorlie Electric Tramways, Ltd.—Capital, £250,000 in £1 shares. Return dated July 10th, 1935. All shares taken up. £250,000 paid. Mortgages and charges: £74,750.

Ever Ready Radio Valve Co., Ltd.—Capital, £1,000 in £1 shares. Return dated July 13th, 1935. 970 shares taken up. £970 paid. Mortgages and charges, nil.

General Electric Co., Ltd.—Capital, £9,600,000 in 1,800,000 6½ per cent. "A" preference, 1,800,000 7½ per cent. "B" preference, 4,400,000 ordinary, and 1,600,000 British ordinary shares of £1. Return dated July 11th, 1935. 1,800,000 "A" preference, 1,800,000 "B" preference, 3,816,702 ordinary shares issued and fully paid up. Mortgages and charges, nil.

Folkestone Electricity Supply Co., Ltd.—Capital, £237,500 in 175,000 ordinary, 50,000 preference, and 12,500 employés' co-partnership shares of £1. Return dated March 26th (filed October 9th), 1935. All shares taken up. £200,000 paid on 140,000 ordinary, 50,000 preference, and 10,000 employés', £37,500 con-

sidered as paid on the remainder. Mortgages and charges: £99,100.

South London Electric Supply Corporation, Ltd.—Capital, £750,000 in 50,000 preference and 700,000 ordinary shares of £1. Return dated April 10th (filed September 3rd), 1935. 30,000 preference and 533,520 ordinary shares taken up. £290,000 paid on 30,000 preference and 260,000 ordinary shares, £273,520 considered as paid on 273,520 ordinary shares. Mortgages and charges: £300,000.

Hampshire Light Railways (Electric) Co., Ltd.—Capital, £1,000 in £10 shares. Return dated June 3rd (filed July 23rd), 1935. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Lincoln Radio Supplies, Ltd.—Capital, £500 in £1 shares. Return dated June 14th (filed August 14th), 1935. 335 shares taken up. £335 paid. Mortgages and charges, nil.

Power Electrode Co., Ltd.—The nominal capital has been increased by the addition of £4,000, in £1 shares, beyond the registered capital of £1,000.

Edwards & Hope, Ltd.—The nominal capital has been increased by the addition of £500 in £1 ordinary shares beyond the registered capital of £1,500.

Southern Appliances, Ltd.—Particulars filed of £600 debentures, authorised November 1st, 1935, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Dowsing Radiant Heat Co., Ltd.—Satisfaction in full on November 15th, 1935, of deposit dated July 30th, 1930, and registered August 12th, 1930. (According to the register of mortgages the deposit registered August 12th, 1930, originally secured all moneys due to bank.)

Instanta Electric, Ltd.—The nominal capital has been increased by the addition of £3,000 in £1 ordinary shares beyond the registered capital of £2,000.

W. T. Henley's Telegraph Works Co., Ltd.—Capital, £1,000,000 in 40,000 preference shares of £5 and 800,000 ordinary shares of £1. Return dated July 12th, 1935. 40,000 preference and 650,000 ordinary shares taken up. £612,480 paid on 39,880 preference and 413,080 ordinary shares. £237,520 considered as paid on 120 preference and 236,920 ordinary shares. Mortgages and charges, nil.

Aron Electricity Meter, Ltd.—Capital, £350,000 in £1 shares. Return dated July 1st, 1935. 151,936 shares taken up. £104,600 15s. paid (including premium of 7s. 6d. per share on 75,773 shares and premium of 28s. 6d. on 195 shares). £75,968 considered as paid on 75,968 shares. Mortgages and charges, nil.

"M. K." Electric, Ltd.—Capital, £2,000 in £1 shares. Return dated July 22nd, 1935. All shares taken up. £768 paid. £1,232 considered as paid. Mortgages and charges, £6,600.

Mirrlees, Bickerton & Day, Ltd.—Capital, £600,000 in 100,000 5½ per cent. cumulative preference and 500,000 ordinary shares of £1 each. Return dated July 9th, 1935. 71,000 preference and 466,000 ordinary shares taken up. £302,500 paid on 71,000 preference and 231,500 ordinary shares. £234,500 considered as paid on the remainder. Mortgages and charges, nil.

W. Sisson & Co., Ltd.—Capital, £50,000 in 5,000 preference, 38,000 ordinary and 7,000 deferred shares, all of £1. Return dated July 1st, 1935. 4,375 preference, 31,711 ordinary, and 7,000 deferred shares taken up. £28,686 paid on 4,375 preference and 24,311 ordinary shares. £14,400 considered as paid on 7,400 ordinary and 7,000 deferred shares. Mortgages and charges, £4,902 19s. 6d. (overdraft, secured by mortgage).

Lisbon Electric Tramways, Ltd.—Capital, £1,500,000 in 1,000,000 ordinary and 500,000 preference shares of £1. Return dated July 8th, 1935. 949,225 ordinary and 425,553 preference shares taken up. £134,026 paid on 134,026 ordinary shares. £1,240,752 considered as paid on 815,199 ordinary and 425,553 preference shares. Mortgages and charges, £378,400.

Intensalite Sign & Fixtures Company, Ltd.—Capital, £1,000 in £1 shares. Return dated July 13th (filed September 14th), 1935. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Tamplin & Makovski, Ltd.—Capital, £20,000 in 10s. shares. Return dated July 10th, 1935. 4,610 shares taken up. £250 paid. £2,055 considered as paid. Mortgages and charges, nil.

Pope's Electric Lamp Co., Ltd.—Capital, £25,100 in 25,000 preference and 100 ordinary shares of £1. Return dated July 11th, 1935. 23,579 preference and 100 ordinary shares taken up. £5,254 paid. £18,425 considered as paid. Mortgages and charges, nil.

City Notes

R. A. Lister & Co., Ltd.—Presiding at the annual meeting held on November 29th last Mr. C. P. Lister (chairman and managing director), said that during the year under review there had been new extensions of the factories at Dursley, and the engine works had been reorganised to ensure the most efficient flow of production. Still further large expansions to plant and buildings had been approved for completion in the near future. Extensive tests and developments in connection with the application of chrome hardening to wearing parts of Diesel engines had been made and the results had proved so satisfactory that suitable production shops had been built and equipped. The rationalisation agreement entered into between them and Ruston & Hornsby, Ltd., in 1930 had been terminated by mutual agreement and both companies had taken steps to safeguard their respective interests. Sales activities in the home market had increased, including those of their subsidiaries, while overseas, despite currency restrictions, tariffs and quotas, their products still enjoyed a large demand. They looked forward to the future with confidence.

The Amazon Telegraph Co., Ltd., reports a profit, including £625 realised on investments, of £26,210, and working expenses of £21,649. After providing £501 for income tax there remains a profit of £4,058 which, with £17,239 brought in, makes £21,298 available. An interim of 2½ per cent., less tax, has been paid, leaving a balance of £16,455. In existing circumstances the Board has considered it advisable to pay no final dividend, but to carry forward the whole of the available balance.

Yarrow & Co., Ltd., held their annual meeting on November 27th, when Sir H. E. Yarrow, Bt., C.B.E. (chairman and managing director), who presided, said that the boiler department had been well employed and a number of installations of land boilers for electric power stations and factories had been successfully completed during the year in different parts of the world.

Waste Heat & Gas Electrical Generating Stations, Ltd.—At an extraordinary meeting held at Newcastle-on-Tyne on November 29th resolutions were passed for the reduction of the capital from £350,000 to £190,000. It was agreed to effect the reduction by returning 10s. per share to holders of the 320,000 shares of £1 each—the capital will then be restored to £350,000 by creating 320,000 new shares of 10s. each.

The Richmond (Surrey) Electric Light & Power Co., Ltd., is holding a meeting on December 16th to consider increasing the capital to £400,000 by the creation of 200,000 additional ordinary shares of £1 each and to amend the articles.

The Associated Equipment Co., Ltd., reports a trading profit to September 30th last of £197,862, an increase of £21,051 on the previous year, to which is added general interest, transfer and registration fees. After deducting directors' fees, depreciation (£48,074) and transferring £30,000 to income tax reserve there is a net profit of £129,198 which, with £233,984 brought in, makes £363,182. General reserve receives £25,000 and the final dividend is 10d. per unit of £1 stock, tax free, making 1s. 3d. per unit, tax free, for the year (approximately 8 1/16 per cent.) (same). This leaves a balance of £244,432 to be carried forward.

The India Rubber, Gutta Percha, & Telegraph Works Co., Ltd., reports a net profit for the year ended September 30th last of £51,185, as compared with £25,053 for the preceding year. To this is added £7,303 brought in. After payment of the preference dividend it is proposed to pay 6 per cent. (against nil) on both the preferred ordinary and ordinary shares, and to place £20,000 to preference dividend reserve, leaving a balance of £9,739 to be carried forward. In the report the directors state that further expansion of the business will be to some extent restricted by the rebuilding of part of the Silvertown factory which has been put in hand. This modernisation and re-equipment programme will be spread over the years 1936 and 1937. Meeting: December 9th.

Edmundson's Electricity Corporation, Ltd., has declared an interim dividend of 3½ per cent. on the ordinary shares.

W. T. Henley's Telegraph Works Co., Ltd., has decided to close its accounts at December 31st in each year instead of at March 31st. The next accounts will therefore cover the period of nine months from April 1st last, and the annual meeting will probably be held at the end of April next or the beginning of May. The final dividend, which will be in respect of the nine months ending December 31st, will be based upon the results for that period. Any interim dividend in future will be payable on October 1st in each year.

Electricity Supply Merger.—It is reported that the directors of the Metropolitan Electric Supply Co., Ltd., and the Notting Hill Electric Lighting Co., Ltd., have entered into a provisional agreement for a fusion of interests. The terms will be issued to shareholders shortly.

Stocks and Shares

TUESDAY EVENING.

THE bold policy of the Treasury in issuing its new loans at what look to be famine prices has had a tonic effect upon Stock Exchange investment markets. The very idea of a Government issue that bears no more than one per cent. interest, short-dated and offered at 98 though it is, serves as an impressive illustration of the official confidence in money being cheap for some time to come. No doubt was expressed as to the certainty of success attending upon the two forms of stock offered on the Wednesday in this week. Prices of all gilt-edged stocks were promptly advanced. Rises ranged from 10s. to 40s. in the markets most nearly connected with British Government securities.

The Government's loans, and the terms of their issue, constitute the predominant influence of the moment. There are other considerations at work, however, of less reassuring nature. Foreign political factors are proving, once more, a source of some disturbance to the markets in the Stock Exchange. The immediate fear is concerned with what action Mussolini may elect to take by way of counterblast to the threatened imposition of oil sanctions. This week's meeting of the British Cabinet is thought likely to assist in bringing matters to a head, but on the other hand, political uncertainty appears to be likely to continue for a week or more longer. It is, moreover, at this season of the year that capital begins to turn to thoughts of window-dressing, though Stock Exchange brokers find in their clients a ready willingness to regard with favour the claims of securities placed before investment. No difficulty is experienced in the marketing of considerable amounts of stock, in spite of the fact that a number of prospective borrowers are known to be waiting the opportunity to issue Corporation, and other such loans, with as little delay as possible.

Gilt Edged Stocks

In the gilt-edged market, West Midlands Joint Electricity 5 per cent. stock has risen 1¼ to 126¼. Central Electricity issues are mostly better. In the London Passenger Transport group, buyers have again come forward to take the "C" stock. The price at 108 shows a rise of 2¼. The recently offered Edmundson's Electricity Corporation 3¼ per cent. debenture stock was over-subscribed. Applications for amounts

up to £1,000 were satisfied in full; after that, the applicants received no more than one-third of their subscriptions. A line of Midland Electric 3½ per cent. debenture stock remains on offer at 101½, free of stamp. The yield is £3 4s. per cent. and the interest is covered, according to the last-published figures, many times over. The first interest payment of approximately 19s. per cent. is due on December 31st next.

Electricity Supply Shares

The demand for electricity supply shares is rather less pronounced than it has been of late, with the result that prices show a tendency to droop. This is so slight as to be hardly reflected in quotations. Northamptons, however, at 51s. 3d. are ⅛ lower. Lancashire Light and Power and Clyde Valley are both 6d. down. County of London ordinary have gone back 1s. The other changes consist mainly of threepence to sixpence each. West Gloucestershire ordinary stock at 90 makes an exception, the price being a point higher on the week. British Power and Light are three-halfpence down, at 29s. 7½d. Atlas keep at about 5s. 6d. Palestine A, after being 49s., recovered to 2½. East Africans at 33s. 6d. are quoted ex dividend.

American Conditions

Financial affairs in the United States are now exercising a more powerful effect upon British Stock Exchange markets than they have done since the 1929 crash in Wall Street. Considerable amounts of money are being invested by people, on this side of the Atlantic, in railroad and utility shares of American companies.

Reason for the present-day attention paid to American stocks and shares can be found in the high range of levels to which ordinary shares of British industrial companies have attained. Against these, the lower quotations, for very much more speculative American industrials, present striking contrast. The speculator sees (or thinks he sees) more chance of capital appreciation in them than in British industrials. Of the higher-priced American issues, American Telephone and Telegraph have fallen 3 points to 157½. International Telephone and Telegraph shares eased off to 12½.

Cable and Wireless

The market in Cable and Wireless stocks is steady without attracting particular interest. The 5½ per cent. preference has gone back 10s. The "A" ordinary stock is higher, by an equal amount, at 29½. Anglo-American issues hold the rises that they secured just lately. Great Northern Telegraphs have further advanced, and at 40½ show a rise of the fraction. Oriental Telephones are a little better at 3½. A few sales of Marconi Marine served to lower the price to 36s. 3d. Telephone and General Trust ordinary are firm at 32s. 6d. and the 7 per cent. preference at 29s. 6d. No changes have occurred in Telephone Properties ordinary at 14s. or Telephone Rentals at 9s. 7½d. Cable Investment Trust preference shares, now quoted ex dividend, have moved up to 10⅞ and the debenture stock, also ex dividend, is 99⅞. Globe Telegraph & Trust shares, ordinary and preference, have gained 6s. 6d. and 7s. 6d. respectively, Telephone Condensers have risen to a shade over £3.

Crompton Parkinson

The outstanding feature of the week amongst the shares in manufacturing companies is another spurt, this time of no less than 15s. a share, in Crompton Parkinson ordinary. These 5s. shares are now standing at 125s. Earlier this year, the price was down to 32s. When the report came out a fortnight ago, profit-taking led to a mild reaction, the price falling back to 94s., at which it was not allowed to remain for long. Buyers came forward in force, and the price, as just mentioned, has been hoisted to 6¼. As mentioned here last week, the value of the shares, ex everything, will be divided by two when the rearrangement of capital is completed, owing, of course, to the fact that the number of shares is to be doubled. The buyers argue that the new Crompton Parkinsons at anything like £3 per share, equivalent, that is, to about £6 at present, will not look overvalued.

Manufacturing and Equipment

Associated Equipment shares are an active market on the basis of 44s., ex the dividend deducted which was from the price on Monday in this week. The dividend of 1s. 3d. per unit tax free, is about ⅛ per cent. more than that of a year ago. Associated Electrical Industries ordinary at 41s. have further advanced and General Electrics are better at 72s. British Insulated & Henleys, at 4¾ and 7⅛ respectively, are both in demand at these advanced prices. British Aluminium went back to 40s. 3d., rallying to 41s. 6d., which latter price leaves a fall of a florin. Reyrolle at 69s. show a small improvement. Ericssons are 3s. 9d. up at 36s. 3d. This market, as a whole, is very firm. International Automatic Telephones at 42s. 6d. and the deferred at 42s. show trifling declines.

Miscellaneous Matters

Faint hopes are stirring in relation to Argentine affairs. Some of the railway stocks have strengthened, and even the preference shares of the Anglo-Argentine Tramways are the turn better. Brazilian Tractions were good until news of a revolution—which appears to be nothing very serious—reduced the price to 9⅞.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend 1933.	Dividend 1934.	Price Dec. 3.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	3¾	—	3 17 6
City of London	1	7½	7½	37/-	—	4 1 0
Clyde Valley	1	7	8	43/-	−6d.	3 14 5
County of London	1	10½	10½	54/-	−1/-	3 17 9
Edmundson's 7% Pref.	1	7	7	36/-	—	3 17 9
Do. Ord.	1	7	8	42/-xd.	—	3 16 2
Elec. Dis. Yorkshire	1	9	9	46/-	−6d.	3 18 3
Elec. Fin. and Securities	1	12½	12½	3⅞	—	3 12 9
Elec. Supply Corporation	1	11	11	3½	—	3 10 3
Lancs Light and Power	1	7½	7½	38/-	−6d.	3 19 0
Lond. Assoc. Electric	1	—	—	34/6	—	4 1 2
London Electric	1	7	8	39/-	—	4 2 0
London Power deb. Red.	Stock	5	5	108½	—	4 12 4
Metropolitan	1	10	10	51/6	−6d.	3 17 8
Midland Counties	1	7	7	38/-	—	3 13 9
Mid. Elec. Power	1	8	8	41/3	—	3 17 6
North Eastern Electric Ordinary	1	6	6	34/-	—	3 10 7
Do. 7% Pref.	1	7	7	35/-	—	4 0 0
Northampton	1	10	10	51/3	−⅛	3 18 0
Notting Hill 6% Pref.	10	6	6	14½	—	4 2 9
North Met. Elec. Ordinary	1	10	10	57/6	—	3 9 5
Do. do. 6% Pref.	1	6	6	32/-	—	3 15 0
Scottish Power	1	8	8	42/6	—	3 15 3
South London	1	7	7	34/-	—	4 2 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	25/6	—	5 17 8
Yorkshire Elec.	1	8	8	44/6	—	3 12 0

PUBLIC BOARDS.

Central Electricity 1950–70	Stock	5	5	116	+1	4 6 0
Do. 1955–75	„	5	5	119	+1	4 4 0
Do. 1951–73	„	4½	4½	110½xd.	—	4 1 4
Do. 1963–93	„	—	3½	103½	+1½	3 7 8
London Elec. Trans. Gtd.	„	—	2½	97	—	2 11 8
London & Home Counties, 1955–75	„	4½	4½	114	—	3 19 0
London Passenger Transport, A.	„	—	4½	121½xd.	+1	3 14 1
Do. do. B.	„	—	5	128½xd.	+2	3 17 10
Do. do. C.	„	3½	4	108	+2½	3 14 1
West Midlands Joint Elec. 1948–68	„	—	5	116½	+1½	4 5 10

TELEGRAPH AND TELEPHONE.

American Tel. & Tel.	$100	9	9	157½	−3	5 14 3
Anglo-Am. Tel. Pref.	Stock	6	6	120	—	5 0 0
Do. Def.	„	1½	1½	29½	—	5 1 8
Cable & Wireless 5½% Pref.	„	2½	4½	105½	−½	3 18 2
Do. A. 7½% Ord.	„	Nil	Nil	29½	+½	—
Do. B. Ord.	„	Nil	Nil	9	—	—
Globe Tel. & Tel. Ord.	10	2½	3½*	15½xd.	+6/6	2 5 6
Do. do. Pref.	10	6	6	14½xd.	+3/4	4 4 3
Great Northern Tel.	10	20	20	40½	+½	4 18 0
Marconi-Marine	1	10	7½	36/3	−⅛	4 2 9
Oriental Telephone Ord.	1	12	12	3½	+⅛	*3 16 10

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	1/-	+3d.	—
Do. do. 2nd Pref.	5	Nil	Nil	9d.	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	„	5	5	1305	−10	—
Do. do. Pref. Ord.	„	8	8	168	—	4 15 8
Brazil Traction	100	—	—	9½	−½	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	98½	—	5 1 6
Mexican Light Common	100	Nil	Nil	2½	—	—
Do. 7% Pref.	100	7	7	3	—	—
Do. 1st Bonds	$500	5	5	40	—	—
Victoria Falls Ord.	1	20	20	3½	—	—
West Riding	1	5	6½	45/-	−⅛	2 17 9

MANUFACTURING COMPANIES.

Aron Electricity Ord.	1	10	15	60/-	—	5 0 0
Assoc. Elec. Ord.	1	4	6	41/-	+1/-	2 18 7
Do. Pref.	1	8	8	37/6	+6d.	4 5 4
Babcock & Wilcox	1	6	8	52/-	−6d.	3 1 6
British Aluminium Ord.	1	5	7½	41/6	−2/-	3 12 3
British Insulated Ord.	1	5	15	4¾	+¼	3 3 0
Brush Ord.	Stock	Nil	Nil	51	—	—
Callender's	1	15	15	3⅛	—	3 18 9
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/-	—	12½	6¼	+¼	0 10 0
Do. 8% Pref.	1	8	8	36/3	—	4 8 4
Edison Swan 1st Pref.	1	7½	7½	27/6	—	5 9 0
Electric Construction	1	Nil	3½	31/3	−9d.	2 4 10
Enfield Cable Ord.	1	25	25	5½	—	4 15 5
English Electric	1	Nil	Nil	19/6	+6d.	—
Do. do. Pref.	1	Nil	Nil	24/-	+1/6	—
Ericssons Tel.	5/-	—	24	36/3	+⅛	—
Ever Ready	5/-	35	35	24/-	—	7 5 10
Ferranti Pref.	1	7	7	27/3	−3d.	5 2 9
G.E.C. Pref.	1	6½	6½	33/-xd.	—	3 18 9
Do. Ord.	1	8	10	72/-	+1/-	2 15 7
Henley's	1	30	30	7½	+¼	4 4 3
Do. 4½% Pref.	5	4½	4½	5½	—	3 16 8
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	5	7½	48/9	—	3 1 7
Siemens Ord.	1	6½	4	25/-	—	3 4 1
Telegraph Construction	£1	Nil	Nil	25/-	—	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

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3138. "Electric ship propulsion systems." General Electric Co., Ltd., H. J. Coates and S. A. G. Emms. January 30th, 1934. (437725.)

3277. "Radio signalling systems." Marconi's Wireless Telegraph Co., Ltd. January 31st, 1933. (437726.)

6341. "Electric welding." British Thomson-Houston Co., Ltd. March 1st, 1933. (437727.)

6969. "Electric-discharge devices." British Thomson-Houston Co., Ltd., J. H. Mitchell and H. R. Ruff. March 5th, 1934. (437728.)

7645. "Electric plug sockets with switches." E. Cookson. March 10th, 1934. (Cognate application 7482/35.) (438031.)

10373. "Wireless and like apparatus for the reception of modulated carrier oscillations." Electric & Musical Industries, Ltd., and C. S. Agate. April 5th, 1934. (Addition to 392456.) (437731.)

13103. "Electrically operated killing or stunning device for animals." W. E. Footner. May 8th, 1933. (437740.)

13145. "Electric stop actions for organs and the like." J. I. Taylor, A. H. Midgley and J. Compton Organ Co., Ltd. May 1st, 1934. (437742.)

13261. "Electric batteries." E. W. Lass. May 2nd, 1934. (437946.)

13280. "Electrical storage batteries." L. Fuller, G. J. A. Fuller, E. W. Sudlow and T. W. Hayes. May 2nd, 1934. (Addition to 383529.) (437947.)

13287. "Electric secondary batteries." A. N. Hazlehurst. May 2nd, 1934. (437948.)

13434. "Metal-vapour electric-discharge vessels." Electrical Equipment & Carbon Co., Ltd. (Elin Akt.-Ges. für Elektrische Industrie). May 3rd, 1934. (437889.)

13546. "Apparatus for electric telegraphy." L. A. Notcutt and J. S. Stower. May 4th, 1934. (437952.)

13593. "Rheostat arrangements, suitable for use as lamp-dimmers." W. Geipel, Ltd., and W. Guy-Pell. May 4th, 1934. (437747.)

13624. "Magnets." Schiele & Bruchsaler Industriewerke Akt.-Ges. and J. A. Crabtree & Co., Ltd. May 5th, 1933. (437955.)

13664. "Apparatus for controlling the flow of gas, electricity, or liquid." Bremner Patents (Holding Co.), Ltd., (in liquidation) and D. O. Bremner. May 5th, 1934. (437750.)

14177. "Electric motor control systems." British Thomson-Houston Co., Ltd., and R. Brooks. May 10th, 1934. (Addition to 423212.) (438043.)

14184. "Electrical signalling systems." Associated Electric Laboratories, Inc. July 10th, 1933. (438045.)

14245. "Electric lamps for cycles." W. J. Hill. May 11th, 1934. (Cognate application 15206/34.) (438049.)

14283. "Method of electrically intensifying signals from light impulses and apparatus therefor." I. G. Farbenindustrie Akt.-Ges. May 11th, 1933. (438051.)

14314. "Thermionic cathodes." General Electric Co., Ltd., H. T. Ramsay and H. P. Rooksby. May 11th, 1934. (437967.)

14370. "Switch controlling arrangements for electric adaptors and switch lampholders" P. E. Gwyer and W. J. Standing. May 12th, 1934. (437896.)

14383/4. "Magnetic separators." Electromagnets, Ltd., and W. E. Box. May 12th, 1934. (438059/437897.)

14407. "Electric primary cells." C. J. Gordon. May 12th, 1934. (437821.)

14840. "Electric couplings employed in electric heating devices." A. King and Associated Electrical Industries, Ltd. May 16th, 1934. (437900.)

15623. "Insulation of electric conductors." English Electric Co., Ltd., and C. D. Jamieson. May 25th, 1934. (438061.)

15718. "Thermally operated electric switches." H. C. Sanders. May 26th, 1934. (437826.)

15845. "Electric-discharge tubes." C. Trenzen. December 4th, 1933. (437828.)

17492. "Electric protective relays." Nalder Bros. & Thompson, Ltd., and C. L. Lipman. June 13th, 1934. (437902.)

17827. "Electric cables." W. T. Henley's Telegraph Works Co., Ltd., and J. H. Savage. June 16th, 1934. (438065.)

18003. "Electric supply meters." British Thomson-Houston Co., Ltd. June 16th, 1933. (437761.)

18154. "Means for effecting regenerative control of electric motors." General Electric Co., Ltd., and E. H. Croft. June 19th, 1934. (437763.)

19683. "Electric signalling systems." W. C. Davey. July 4th, 1934. (Cognate application 24724/34.) (437976.)

20710. "Electromagnetic track-brakes for rail vehicles." E.M.B. Co., Ltd., G. N. Cadbury and S. Smith. July 14th, 1934. (437834.)

20840. "Electron-discharge tubes." Steatit-Magnesia Akt.-Ges. July 18th, 1933. (438070.)

22898. "Electrical control systems." Siemens & Halske Akt.-Ges. August 22nd, 1933. (437981.)

23839. "Electric selective systems." Siemens Bros. & Co., Ltd., and H. E. Humphries. August 18th, 1934. (437766.)

24813. "Light polarising devices." P. V. Reveley and Baird Television, Ltd. August 28th, 1934. (437988.)

25012. "Electrically heated hair-drying apparatus." H. B. Mead and W. E. Sparks. August 30th, 1934. (437842.)

25590. "Apparatus for testing insulation and dielectric materials for capacitance and dielectric loss." Siemens & Halske Akt.-Ges. September 5th, 1933. (437989.)

33527. "Microphones." Marconi's Wireless Telegraph Co., Ltd. November 21st, 1933. (438090.)

35860. "Metallised ribbons and the like for electric cables." Siemens & Halske Akt.-Ges. December 13th, 1933. (438096.)

35861. "Sheathing for electric cables." Siemens & Halske Akt.-Ges. December 13th, 1933. (437917.)

36569. "Electric motor control systems." British Thomson-Houston Co., Ltd. December 22nd, 1933. (437772.)

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2010. "Electrical signalling systems." Etablissements E. Belin. January 19th, 1934. (437997.)

2103. "Electric braking arrangements for electric motors." G. M. Pestarini. January 22nd, 1934. (437920.)

6128. "Vibration translating devices such as electric reproducers for use with sound records." Electrical Research Products, Inc. March 3rd, 1934. (437783.)

6296. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd. February 27th, 1934. (437784.)

7475. "Electric-discharge tube for short-wave use." Radio-akt.-Ges. D. S. Loewe. March 13th, 1934. (437924.)

8147. "Flashlight lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 26th, 1934. (437868.)

8158. "Electro-magnetic sound recording systems." C. Lorenz Akt.-Ges. March 16th, 1934. (437926.)

8731. "Electron-discharge devices and electrical oscillation generators incorporating the same." Marconi's Wireless Telegraph Co., Ltd. March 20th, 1934. (437788.)

12348. "Electromagnetically operated electric switches." M. Payne. April 24th, 1935. (438002.)

13440. "Device for testing the sparking plugs of internal combustion engines by means of neon tubes." W. Kern. May 4th, 1934. (438026.)

15075. "Cells for alkali chloride electrolysis." P. Pestalozza. May 23rd, 1934. (438009.)

15077. "Electric circuit interruptors." British Thomson-Houston Co., Ltd. May 23rd, 1934. (437933.)

15544. "Inverse reducer circuits for use in the electric supply to X-ray tubes." British Thomson-Houston Co., Ltd. May 28th, 1934. (437935.)

18120. "Radio receiver or the like with manual volume control." E. K. Cole, Ltd. (Aga Baltic Radio Aktiebolaget). June 25th, 1935. (438014.)

18332. "Temperature indicators for transformers." British Thomson-Houston Co., Ltd. June 30th, 1934. (438015.)

21769. "Thermionic valves for use in radio signalling systems." Marconi's Wireless Telegraph Co., Ltd. January 31st, 1933. (Divided out of 437726.) (437804.)

23515. "Modulated high frequency circuit arrangements." Telefunken Ges. für Drahtlose Telegraphie. August 21st, 1934. (438018.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 27th :—

Suprexa. No. 559479. Class 4. Carbons for electrical purposes.—Charles H. Champion & Co., Ltd., National House, 60-66, Wardour Street, W.1.

Stainweld. No. 557825. Class 5. Metal in rods for use in electric welding.—Lincoln Electric Co., Cleveland, O., U.S.A. (British representatives: Stevens, Langner, Parry & Rollinson, 5-9, Quality Court, Chancery Lane, W.C.2.).

Emitron. No. 563938. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Electric and Musical Industries, Ltd., Hayes, Middlesex.

Uryflex. No. 563371. Class 13. Electric lamps (ordinary).—Sprayworks, Ltd., Devonshire Works, Barley Mow Lane, Chiswick, W.4.

Newtric. No. 564058. All goods in Class 13.—Allbright Electric Co., Ltd., 2-5, Dingley Row, City Road, E.C.1.

Fuel Research Progress

THE Department of Scientific and Industrial Research has issued the report of the Fuel Research Board, together with that of the director of fuel research, for the year ended March 31st, 1935 (Stationery Office, 3s. 6d. net). It is shown that despite increasing industrial prosperity and rising population the consumption of coal in Great Britain has fallen, not due to the replacement of coal by oil but due mainly to the increased efficiency of practically every process for which coal is used. In 1910 about 4¼ million tons of coal was required to produce 2,500 million kWh of electricity, while for the 16,100 million kWh generated by authorised undertakings in 1934 only 11.4 million tons was needed. If the efficiency of production of electrical power had remained the same 29 million tons of coal would have been used in 1934. An overall thermal efficiency exceeding 27 per cent. has now been obtained in large installations, and, it is stated, further major advances in this direction cannot be expected. The capacity of individual boilers has been raised from 20,000 to 300,000 lb. of steam per hour, and an efficiency exceeding 90 per cent. has been attained in this section of the plant.

The economies in the use of coal in furnaces have been secured largely by burning it in a form that enables it to be fed at a controlled rate into the combustion space. The greatly increased use of mechanical stokers and of pulverised fuel has given to coal and coke a large measure of the flexibility possessed by fluids, such as oil and gas. Future improvements leading to increased economy in the use of fuel, it is stated, will depend more and more on the selection of the most suitable coal for the particular purpose required, and pretreatment before final combustion will become of increasing importance. This starts at the collieries, where the coal is graded and cleaned as required, or converted into gas, coke and tar, motor spirit or oils, or its energy converted into electricity. The programme of research carried out by the Board is related in a greater or lesser measure to all these developments.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Houses (66), Willowbank Road (tenement type); A. B. Gardner, 11, Broad Street.

Aberystwyth.—Extensions to infirmary (£25,000), for the Management Committee; secretary.

Annfield Plain.—Houses (200); N. Elliott, U.D.C. surveyor.

Ayrshire.—Schools, Kilwinning, electrical work, for County E.C.; William Reid, county architect, Ayr.

Baillieston (LANARKSHIRE).—Houses (164), Garrow Hill Garden estate, Barrachnie, for Henry Boot (Garden Estate), Ltd.

Bath.—Extensions to City of Bath Girls' School; J. Long & Sons, Ltd., builders.

Becontree.—Toy factory, Oxlow Lane; A. & H. Simmons.

Bedlington.—Cycle factory for J. H. Millne, 110, Front Street.

Bexhill-on-Sea.—Estate development near Church Street, for J. W. Cripps; E. Bunce, architect.

Bilston.—Factory, Laxdale estate, for Pegrex Tool & Manufacturing Co., 222, Lichfield Road, Aston, Birmingham, 6; Harrison & Tracey, County Chambers, Corporation Street, Birmingham.

Birmingham.—Coroner's Court, Newton Street; town clerk. Offices, Colmore Row, for the Prudential Assurance Co., Ltd., Holborn Bars, London, E.C.1; C. Bryant & Sons, builders, Whitmore Road. Four-storey extension to Parker, Winder & Achurch, Ltd., Broad Street (£45,000), with electrical work; J. R. Deacon, builders, Lichfield.

Blackhall (DURHAM).—Houses (37), Elm Avenue; W. Trotter.

Blackpool.—Hotel on the promenade for Matthew, Brown & Co.; A. Best, architect, Clifton Street.

Bournemouth.—Cinema (2,500 seats), Westover Road, for Associated British Cinemas, Ltd., 30, Golden Square, London, W.1.

Bradford.—Grammar School, Clock House estate, Frizinghall (£140,000), with electrical work; Petch & Fermaud, architects, 8, Buckingham Palace Road, London, S.W.1.

Braunton (DEVONSHIRE).—Houses (80), for W. Challis.

Brighton.—School (512 places), Pelham Street; director of education.

Brockenhurst (HAMPSHIRE).—Church (Baptist) and school rooms, Netherton Road; L. M. Field, architect, Gosport.

Brownhills (STAFFORDSHIRE).—Houses (26½ acre site), Wyrley Grove estate; U.D.C. surveyor.

Bury (LANCASHIRE).—School (300 places), East Ward; director of education.

Canterbury.—Shops and flats, St. Stephen's Road, for C. H. H. Kenworthy.

Cardiff.—Electricity showrooms, Old Fish Market (£24,988); J. E. Turner & Sons, builders.

Carlisle.—Admission block and sanatorium to the Garlands Institution for the Cumberland and Westmorland Mental Board; H. E. Ayris, architect, 68, Lowther Street.

Chatham.—Houses (89), on various sites; R. L. Honey, borough engineer.

Chelmsford.—Extensions to Arc works; Crompton Parkinson, Ltd.

Chorley.—Houses (29); R.D.C. surveyor.

Colwyn Bay.—Houses, Tan Lane; W. J. Dunning, borough engineer.

Coseley (STAFFORDSHIRE).—Cinema, junction of Castle Street and Mason Street, for Leon Salberg and S. W. Clift.

Coventry.—Cinema, Corporation Street, for the Plaza (Coventry), Ltd.

Croydon.—Houses, Crown Hill and Davidson Road; borough engineer. Extensions to Public Assistance Institution (£38,460); Henry Berney, architect.

Darfield.—Houses (38), Woodhall Lane site; Dyson, Cawthorne & Coles, architects, 25, Regent Street, Barnsley.

Dover.—Cinema, to replace Regent Cinema, London Road (£60,000); Universal Cinema Theatres, Ltd. Two schools for Borough E.C.; director of education.

Dunsfold.—Electric lighting installation, Dunsfold Church; W. D. Caroë, architect to Ecclesiastical Commissioners.

Durham.—Durham Johnston Council School for County E.C. (£35,000); F. Willey, architect, 34, Old Elvet.

East Lothian.—Houses (173), for C.C.; clerk, Haddington.

Ebbw Vale.—Houses (52), Glyncoed; G. A. Brown, junior, builder.

Ellon (ABERDEENSHIRE).—Houses (27); G. Duncan, 87, Station Road.

Feltham.—Houses, Hounslow Road; T. Wareham, Heston Road, Heston.

Flint.—Houses (70); A. Snape, builder, Chester Road.

Glamorgan.—Police station and court, Neath, also alterations and additions to Blaenllynfi Council school; clerk to the County Council, Cardiff.

Glasgow.—Houses (250), Kelvindale Road, &c.; housing director. Hotel, for Bellgrove Hotels, Ltd. (£30,000): Charles J. McNair, architect, Glasgow.

Hendon.—Houses, Edgware Road; Welch & Lander, 8, Gloucester Place, W.1. Estate development, Watford by-pass; J. Laing & Son, Ltd., Mill Hill, N.W.7.

Hertfordshire.—Library, Bushey Heath, for C.C.; R. D. Elliott, architect, 29, Bedford Row, London, W.C.1.

Heston.—Conversion of cinema to public bazaar, Hanworth Road; P. Chase Gardener & Co.

Hitchin.—Houses (120); R.D.C. surveyor.

Hoylake.—Houses (76); U.D.C. surveyor.

Ilford.—School, Aldborough Road, Newbury Park, for borough E.C.; L. E. J. Reynolds, education architect, Town Hall.

Ipswich.—Houses (404), Greenwich and Gloucester estates; borough surveyor.

Irish Free State.—(KILKENNY).—Houses (38), Urlingford Union Buildings site; T. Kelly, consulting engineer, 35, Patrick Street. (ROSCOMMON).—County hospital; J. R. Boyd Barrett, architect, 61, South Mall, Cork.

Isle of Ely.—Senior school, Chatteris, for E.C.

Isleworth.—Casual wards (£23,592); E. Clarke & Sons, Ltd., Sayers Court, Addlestone.

Kearsley.—Additions to Council Offices, Bolton Road; Ormrod, Pomeroy & Roy, architects, 21, Acresfield Road, Bolton.

Kent.—Admission hospital and two convalescent villas, Maidstone, for County Mental Hospital; county architect.

Kettering.—Cinema, High Street, for N. Cohen & Rafer (£70,000); G. Coles, architect.

Largs (AYRSHIRE).—Houses (50), (£45,500); Mactaggart & Mickel, builders, Glasgow.

Leatherhead.—Houses (26), Craddocks Avenue, for Mr Mison. Extensions to Thermega factory, for the directors; C. C. Makens, architect.

Leicestershire.—Technical institute, Melton Mowbray; Orton & Co., builders, Coalville.

Littleport.—Alterations to Empire Cinema; F. H. Curtis.

London.—(E.C.3.).—Buildings, 17, Gracechurch Street and Bell Yard, and 93, Cheapside, and 39-40, King Street; Campbell Jones, Sons & Smithers, 9, Dowgate Hill, E.C.4. Buildings, 29, Mincing Lane and 26-8, Mark Lane; Henry Tanner, 3, Hanover Square, W.1. Buildings, Poultry and Grocers' Hall Court; Lawrence M. Gotch, 1, Paternoster Row, E.C.1. Improvements to the Guildhall; Sir Giles Gilbert Scott, 3, Field Court, Gray's Inn, W.C.1. (E.C.4.)—Buildings, St. Andrew's Hill and Ireland Yard; Herbert O. Ellis & Clarke. (HAMMERSMITH).—Factory and squash racquets club, Beavor Lane; E. B. Musman, 1, Carteret Street, S.W.1. Extensions to Godolphin and Latymer School, Iffley Road; V. O. Rees, 33, Bedford Place, W.C.1. (POPLAR).—Factory, 616, Old Ford Road; J. Lubelsky & Sons, Ltd., 616, Old Ford Road, E.3. (ST. MARYLEBONE).—Flats and underground garage, High Street and Marylebone Road; B. L. Rhoads, 16, Glentworth Street, N.W.1. Premises, 23-5, Portland Place; General Nursing Council for England and Wales, 23, Portland Place, W.1. (STOKE NEWINGTON).—Public hall (£21,490); Foster & Dicksee, Ltd., 33, Davies Street, W.1.

Meir (STAFFORDSHIRE).—Cinema, Sandon Road; Clewlow, Knight & Plumpton.

Middlesbrough.—Houses, between Northern Road and Malden Road; J. Gilmore, builder, 111, West Lane. Houses, St. Mary's Walk; C. G. and T. Duncanson, builders, "Beechwood," Acklam. Cinema, Acklam Road South, for Councillor J. Reubens; W. E. Haslock, architect, 143, Albert Road.

Middlesex.—School, Harrow Weald, for County E.C.

Monmouth.—Houses (44), Wyesham site; borough surveyor.

Newcastle-on-Tyne.—Bus station, Gallowgate, for the United Automobile Services, Ltd., Grange Road, Darlington.

Northern Ireland. — (ANTRIM). — Elementary school for Regional E.C.

Peterborough.—Cinema (1,400 seats), Broadway; Odeon Theatres, Ltd., 7, Park Lane, London, W.1.

Potters Bar.—Houses, Southgate Road; Hall & Martyn, Ltd.

Richmond (YORKSHIRE).—Houses, Newsham and Ravensworth; R.D.C. surveyor, 36, Market Place.

Roxburghshire.—School, Kelso; director of education, St. Boswells.

Scarborough.—Houses (92) and shops, Northstead estate; J. P. Watson, borough engineer.

Slough.—Seven factories, Montrose Avenue, for Slough Estates, Ltd.

Southall.—Houses (24), Craven Avenue; Property Development Co., Ltd.

Southport.—Senior schools, Meols Cop, for Borough E.C.; Mr. Barnish, architect.

Stockport.—Houses (500), Bosden Fold estate. Commercial Road, Hazel Grove; W. G. West, builder, Highfield Park estate, Kingsway, Bredbury. Cinema, Cheadle Green; Charles Hartley, architect, 128, Buxton Road, Great Moor.

Stoke-on-Trent.—Houses (75), Cornhill estate (£23,598); T. B. Cartlidge. Extensions to Spode works; W. T. Copeland & Sons, Ltd.

Stroud.—Houses (42); R.D.C. surveyor.

Sunbury.—Houses, Green Lane; Lucas Bros., 64, Markhouse Road, E.17.

Sunderland.—Houses (24), Viewforth estate; W. and T. R. Milburn, architects, 17, Fawcett Street, Sunderland. Alterations to the Mayfair Manufacturing Co., Low Row; G. E. Matkin, architect, Fawcett Street. Cinema, Pallion Road, for Pallion (Sunderland) Cinema, Ltd.

Surrey.—Hospital, St. Helier (£665,000), for C.C.

Sutton Coldfield.—Houses (39), Halton Road; Arnold & Co. Houses (24), Melrose Avenue; F. T. Matthews. Houses (25), Tamworth Road; Davis & Son.

Torquay.—School, Teignmouth Road; director of education.

Twickenham.—Houses (318), between Crane Park and Cherisey Road; Wates (Malden), Ltd. Houses (58), Rosalind estate; D.S.M. Estates, Ltd., Hounslow.

Walthamstow.—Extensions to Connaught Hospital; W. Stewart, architect, 4, High Street, Aldgate, London, E.C.3.

Warwick.—Cinema, Castle Hill, Jury Street, for the Bath Cinema (Leamington), Ltd.

Warwickshire.—Senior school, Southam; A. C. Bunch, county architect, Shire Hall, Warwick.

West Bromwich.—Extensions to store, High Street; F. W. Woolworth & Co., Ltd. Extensions to Works, Roebuck Lane; Ashmore Engineering Co.

West Riding.—School, Warmsworth, for County E.C.; education architect, Wakefield. Senior schools, Ripon (£24,450), for County E.C.; education architect, Wakefield.

Wincanton.—Houses (42); R. Earnshaw, R.D.C. architect.

Wisbech.—Houses (21), near Stow Lane; R. H. Palmer.

Wolvercote (OXFORDSHIRE).—Houses (104), Godstow estate; P. J. Frewin.